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THE

REPERTORY

OF

ARTS, MANUFACTURES,

AND

AGRICULTURE.

Consisting of

ORIGINAL COMMUNICATIONS,

SPECIFICATIONS OF PATENT INVENTIONS,

PRACTICAL AND INTERESTING PAPERS,

SELECTED FROM

THE PHILOSOPHICAL TRANSACTIONS AND SCIENTIFIC JOURNALS OF ALL NATIONS.

MONTHLY INTELLIGENCE

RELATING TO

THE USEFUL ARTS,

PROCEEDINGS OF LEARNED SOCIETIES,

AND

NOTICES OF ALL PATENTS GRANTED FOR INVENTIONS.

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AGRICULTURE.

NUMBER XIII. SECOND SERIES. JUNE 1, 1803.

Specification of the Patent granted to JOSEPH BRINDLEY, *of Rochester, in the County of Kent, Ship-builder; for certain Methods of more effectually securing Ships Beams to their Sides.* Dated September 20, 1802.

With a Plate.

TO all to whom these presents shall come, &c. Now KNOW YE, that in compliance with the said proviso, I the said Joseph Brindley do hereby declare that my invention is described in the drawings and descriptions thereof. (See Plate I.) In witness whereof, &c.

REFERENCES to Plate I.

Fig. 1, is a representation of part of the flat of a ship's deck. A, are the timbers and plank of a ship's side, as commonly constructed. B, B, are the beams, with an increased scantling at the ends, for the purpose of strength, and to admit a deeper tenon and mortise for the tie-pieces C; but if, in converting the beams, it may not

not be convenient to increase the siding at the ends, then scantling pieces may be brought against the side of the beams (and hanging-knees if used), coked and bolted in a proper manner, to answer the purpose of cleats against the tie-pieces C, as described by H H. C, C, C, are scantling or tie-pieces of timber or carlings, of proper breadth and thickness to receive the fastenings of one, two, or three strakes of the plank on the deck, and of proper lengths to tenon or mortise to the sides of the beams; their upper sides to let down one, two, or more inches below the top of the beams, for the purpose of admitting a score on the beams, sufficient to receive the one strake or plank F, or more strakes if necessary, which are to meet in contact with the tie-pieces C; but in some cases the upper sides of the tie-pieces C may be kept well with the top of the beams, and in that case the score will be omitted; and in some cases it may be necessary to take part of the wood from the under side of the planks F and beams B, for the planks F to meet in contact with the tie-pieces C, or otherwise, as occasion may require. D, D, are scantling pieces of timber, fitted in close between the tie-pieces C and side of the ship, tenoned or mortised to the beams or plain, cut between the beams, as circumstances may require: their upper sides may be well with the top of the beams, or below, of sufficient distance to receive ledges, or as may be most convenient; and of proper depth to convey bolts through them, and tie-pieces C, and side of the ship, and fastened to the planks of the deck with cokes, nails, bolts, or tree-nails, if necessary, or otherwise omitted, as occasion may require: openings may be cut in the joint of the fillings D, to give air. E, E, are bolts drove through the tie-pieces C, fillings D, and side of the ship, and well clenched or forelocked within or without board, or to

have

have iron or brass nuts screwed on their ends. F, F, are dotted lines, shewing the plank F scored on the beams, and let down, preserving its whole thickness, to meet in contact with the tie-pieces C, fastened to the tie-pieces C and beams B with bolts, nails, cokes, or tree-nails. G, G, are ledges on the top of the fillings D, for the purpose of giving stop to the caulking of the deck, as well as to receive the fastenings of the plank and water-ways of the deck, which may be of cokes, nails, bolts, or tree-nails. H, H, are pieces of timber against the sides of the beams, and against the tie-pieces C, to answer the purpose of cleats, and properly secured to the beams with cokes of wood, iron, or copper, or nails, bolts, or tree-nails; and pieces of timber may be fastened to hanging-knees (if used), in a similar manner: the tie-pieces C are to tenon into the pieces of timber H, H, in the same way as into the sides of the beams. It must be observed, that in very large ships the scantling piece C may be increased in breadth; or if not, another piece may be mortised or tenoned to the beams by the side of C, for the purpose of receiving the fastenings of another strake next the plank F, and the bolts E to go through both that and the tie-pieces C, and side of the ship.

Fig. 2, represents part of the midship section of a ship, and in conformity to Fig. 1. A, the timber and plank of the side; B, the beam; C, the scantling or tie-piece; D, the scantling pieces of timber filled in between the tie-pieces C and side of the ship; E, the bolts drove through the tie-pieces C, fillings D, and side of the ship; F, the strake of the deck, bolted, coked, nailed, or tree-nailed to the beams and tie-pieces C. In large ships the tie-pieces C may be increased in breadth, or there may be another tie piece let down beside C, for the purpose

of receiving the fastenings of another strake next the strake F. G, the ledges to receive the fastenings of the deck; and H, the waterways and plank on the deck, as in the common way. I, represents an additional increase of strength, and to be used or omitted occasionally, being a scantling piece or pieces of timber, let upwards, tenoned or mortised to the beams, and to be in contact with the tie-pieces C, and fastened to the tie-pieces C, planks F, and beams B, with bolts, cokes, nails, or tree-nails, and to have scantling pieces filled in between it or them and side of the ship, and bolted through all in the same manner as the fillings D, if necessary, or omitted, as circumstances may require.

Fig. 3, represents another method of strength. A, is part of the plank and timber of the side and beam of the ship as usual. B, is an iron T plate or plates, and occasionally knees, on one or on each side the beams and timbers of the ship's frame, let in (or not let into) the sides of the timbers, and properly fastened to the beams and timbers with bolts, cokes, or nails.

Fig. 4, represents another method of strength. A A A, is the side of the ship, with beams, &c. B, scantling pieces of timber fayed to the ship's side, and mortised to the end of the beam, and properly secured to the ship's side with bolts; but in some cases B may run up sufficiently to receive the end of the beams, which may be cut off and butted against it, the end of B must be cut, and the wood taken away, for the beam to lodge upon it, or cleated under the beam. C, is an iron strap, to go round the scantling piece B, and bolted to that and the sides of the beams; the strap may occasionally go round the timbers of the ship's frame, and bolt to them and beams, &c. as circumstances may require. D, is an iron brace or braces, properly secured in, and bolted to, the beam and

and scantling piece B; the brace L may vary in shape according to the dotted lines, or be occasionally made into the form of a quadrant of a circle. E, is an iron square, bolted through the beams of the deck, sole F, and scantling piece B, and side of the ship: the square may be in contact with, and bolted through, the ship's side next the plank withinside, and occasionally used in the midship of ships.

Fig. 5, is another method of strength. A A, represent the beam, timber, and planks of the ship's side, &c. B, is a scantling or check piece or pieces of timber, to be bolted and coked, or tree-nailed, on one or on each side of the timbers of the frame and the sides of the beams to run through the openings of the ship's frame to nearly the outside of the timbers, and to form a dove-tail against the side of the timber of the frame. C, C, are pieces of timber, fastened on each side of the timbers of the frame (and planks of the ships side occasionally) with keys, cokes, bolts, nails, or tree-nails, and their ends to butt on the scantling piece B in the form of dove-tails. D, is a coke of iron or wood, let into the scantling piece B and the waterway; in some cases the waterway may let into a score on the checks B. C, C, are plates of iron, brought and fastened against the check pieces B, and to be used or omitted occasionally.

Fig. 6, is a representation of the check pieces B with the dove-tails K, K, to be used or omitted, as circumstances may require, and fastened to the beams and ship's side with cokes, bolts, nails, or treenails, and in conformity to Fig. 5, the dove-tails K, K, may be formed by the sides of the timbers being in contact with the check pieces B, or an opening may be left for pieces of iron or wood to be joined in between.

Fig.

Fig. 7, represents the iron strap C in Fig. 4 round the scantling piece B, or round the outside of the timbers of the frame, with the fastenings to the beam, &c. and in conformity to Fig. 4.

Fig. 8, is another method of strength, and may be used occasionally, being a tie-bolt or bolts placed on one side, or on all sides of the beams, drove through the side of the ship, and clenched, forelocked, or screwed with nuts without board, and fastened withinside to the beams with cokes, nails, or bolts, and occasionally let into the beams, or otherwise, as circumstances may require.

Fig. 9, is a neck bolt or bolts, to be used occasionally, drove through the tie-pieces C, and well clenched, screwed, or forelocked, and fastened properly to the side of the beams, for the purpose of assisting the strength of the mortise or tenon in the sides of the beams, or wooden braces may be used for the same purpose, fastened to the underside or upperside of carlings, and to the tie-pieces C, on a thwart-ship direction. The braces may be dove-tailed, keyed, or coked to the tie-pieces C, planks F, and carlings of the ship. The tie-pieces C, in Fig. 1, may (instead of mortising to the pieces H, H,) mortise and tenon to each beam, and cleats butted against the tie-pieces C, properly coked and fastened to the beams, if (as in some cases) the beams of ships run through to the outside of the timber of the frame. Then they may be secured to the ship's side in a similar manner as the check pieces B, in Figs. 5 and 6, with pieces dove-tailed on their ends, &c. In some cases part of the method in Fig. 1 may be omitted by the exclusion of the whole or part of the scantling pieces D; but I by all means prefer the use of all the scantling pieces D in conjunction with the tie-pieces C, bolts E, and side of the ship.

The

The drawings to which my specification refers, are by a scale of three-quarters of an inch to one foot *; but as the methods are applicable to different descriptions of ships or vessels, it is necessary to observe, that the materials used may be increased or decreased in number and size, in proportion as circumstances may require. The strength of every part of them must be proportioned to the security required, which to a workman can be no difficulty to ascertain, and properly provide for. And as these methods of connexion are very extensive in their applications, it is proper to observe, that some of them may be used separately, and some of them conjunctively, according to the different ships or vessels on which they are used.

Observations by the Patentee.

This invention having for its object an important improvement in the practical part of ship-building, it cannot but be highly interesting to the country, and particularly to mariners, merchants, and ship-builders: for all who have observed the powerful lever created by the masts and sails operating against the body of the vessel, and have experienced the violent and convulsive motion of a ship in gales of wind, must allow that the proper fastening of the ship's sides to the beams is of the utmost consequence; for I verily believe that hundreds of ships, and thousands of brave men, have perished through defects in that part of ship-building. The mode most commonly used at present to secure the beams to the sides of ships, is to have one hanging and one lodging knee to each beam. But in the greatest number of ships built in the North of England, the hanging-knees, for the sake of

* In the plate they are reduced one-half.

stowage, are omitted, and the only fastening they have are the lodging-knees. My plan is to exclude the use of lodging-knees altogether; but it may be used in conjunction with hanging-knees, if thought necessary. It is my intention to demonstrate, under three distinct heads, a few of the many national advantages that will result from my method of connexion. First, superior strength; secondly, the saving of expense; and, thirdly, the great benefit of expedition. In respect to strength, I will just observe, that there is an established axiom in mechanics, that in the fabrication of any mechanical body, as a ship, it is perfect and complete when all the component parts have an equal share of strength in proportion to the resistance required. I will prove (by the following comparison) that the methods as described in Fig. 1, come nearer to such a state of perfection than any other mode now practised. Suppose (for instance, as is now the practice) five beams are fastened to the side by five lodging-knees, bolted in and out, and fore and aft ways, it is certain the five knees are attached to each beam separately; for by being cut off, and let down between the beams or upper edge of the clamps, it is evident that each knee can only affect the one beam to which it is fastened; it can have no connexion, nor lend any assistance to another; so that when a beam happens (which is very common) to be a little short of timbers at the ship's side, the motion and working of the ship soon gulls the holes, loosens or breaks the bolts, and renders the lodging-knee useless. Hence the dependance of the beam is reduced to the hanging-knee alone, which is more particularly designed for another purpose; *viz.* to resist the lateral twist of the ship occasioned by the straining of the masts and sails, and the weight of metal, &c. &c. And I am convinced the principal cause of the

failure

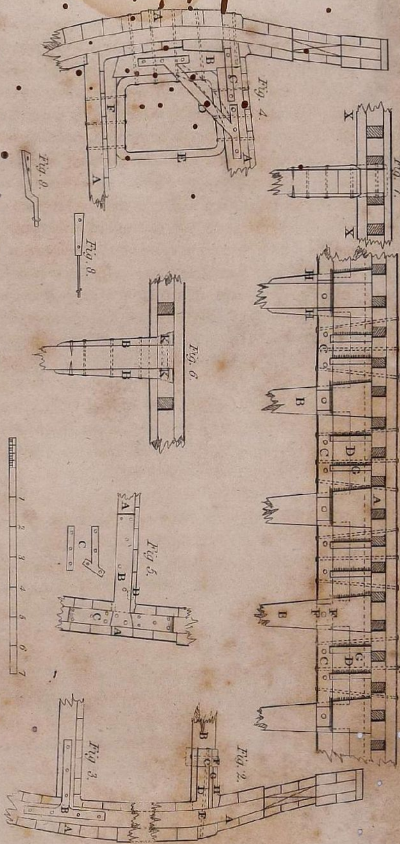
Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 8.
1
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7

failure in the hanging-knees, is their being forced to answer two purposes, and not being equal to the resistance required. Innumerable are the disadvantages and dangers attending the use of lodging-knees; especially in such ships (as before observed) where nothing but lodging-knees are used. All these dangers and inconveniences will be avoided by the adoption of the plan I propose. For by the tie-pieces or carlings C, mortised into the five beams, and bolted through the fillings D, and side of the ship; then the thick plank F bolted up and downways to the beams and tie pieces C, the five beams are united together, and make one compound of strength, which may be continued all fore and aft; and every beam of the deck will have such an immediate connexion with the ship's side, and with each other, as to make it impossible there can be any partial strain, or working in one beam more than another. The whole are connected upon the same principle of strength as the shifts of plank on a ship's bottom. It is necessary to observe that the strake or plank F, is one, two, (or more inches) thicker than the other planks of the deck; and is let into a score or mortise (preserving its entire thickness and breadth) on the top of the beams; so that the beams cannot work separately athwart ships without breaking the plank F edgewise; which is impossible, as the other planks of the deck are caulked and nailed to the beams and ledges on each side of it, and jambed in such a manner as no one part can give way without the whole; the tie-pieces cannot work sidewise, because they are bolted to the plank F, and all the ledges are butted in a mortise against them, entirely across the ship; and all the planks of the deck nailed to the beams and ledges; making, together, such an immense power of connection that no possible complaint can exist against the practice

practice of this simple plan of improvement. But another very important advantage in point of strength (attending these methods), is, that it not only unites the ship's sides to the beams more securely than was ever before practised, but it strengthens and stiffens the sides of the ship, all fore and aft, in a very remarkable manner: for it ought to be noticed, that one side of the ship is equally binding as, and most materially assists the other. To prove this, I will suppose a ship (secured upon this plan) was to receive a blow from another, at the height of the range of the deck, by the concussion the beams would have a tendency to recede from that side of the ship next whence the blow was received, and break the bolts and tear away the mortises at the side and on the top of the beams: but this could not take place unless the mortises on the top of the beams were to tear away on the opposite side of the ship at the same time; which, in my opinion, is next to an impossibility, for this evident reason, if the mortises on the top of the beams tear away by the concussion on that side, it must be in an opposite direction to the ship's side, *viz.* entirely across the deck, which is too improbable a case: and I am persuaded it must be evident to every one, who is not prejudiced by long habit and custom, that the plan I recommend is one universal, solid, and compact body of mechanism, simple in its operation, and perfect when executed.

In respect to the saving, I will just state that it is unnecessary to enter into a particular detail of every expenditure that will accompany this plan, for it will vary according to circumstances, in proportion to different ships and vessels on which it may be practised, and also the places where it may be used. I do assert, that it will

save

save (at least) two-thirds of the value of all the lodging-knees used in a first-rate ship of war, and as much in an East Indiaman and all other ships in proportion. On board the Victory, of 100 guns, there are about 360 lodging-knees, and at the present high price the Navy-Board allows for knee-timber, let any one calculate, and they will find, by the use of my plan, the saving to be almost incredible. There is still another very important fact, and what is of the utmost national consequence. It will save immense quantities of fine oak-timbers, which are now destroyed to obtain knees for the navy, &c. The trunks of thousands of trees are cut asunder to obtain the limbs for knees, which trunks would otherwise make some of the best futtecks in ships frames. I do not mention this from imperfect information; it is a fact I have been witness to, and know it is a practice very common. I have no doubt but many of the gun-deck-knees of a first-rate ship of war were cut from timber logs that measured from fifty to one hundred feet or more in each log; and the reason of this will appear obvious to every one who considers the disproportionate size of the body to the limbs. The East India Company have (from the great difficulty of obtaining wood knees) substituted iron ones in their ships, which is very expensive, and inadequate to the purpose, for it is impossible the fastenings in iron knees can be so safe as where wood and iron are united together, for the following plain reason: the bolts that go through iron knees are only prevented from drawing out by the head and clench of the bolt, whereas in all fastenings of wood the bolts are driven with a strong drift to them, which, added to their head and clench, must make them infinitely stronger than the fastenings in iron knees, which ought never to be used but in cases of real necessity. I will observe on this head, that, inde-

pendant of the great strength obtained by my methods of connexion, in point of expense every public body, as well as private individual, will find their own interest in the use of them.

This plan admits of many advantages in respect to expedition; but I will confine myself to one or two of them. In the present practice, where hanging and lodging knees are used, the fore and aft bolts are conveyed through the beam and each knee, and they must all be complete before the waterways and planks of the deck can be laid; but such is the extreme difficulty to obtain knees, that ships are kept from launching, and in docks, many months longer than otherwise they would be, besides exposing the insides of ships to heavy rains, which rot the timbers and ends of the beams. This is a very serious and important consideration. The plan I propose will remove these inconveniences, as, not having any connexion with hanging-knees (which, for the better carrying my plan into effect, may be fastened to the under side of the beam) it can be used immediately. The beams are crossed and lodged on the clamps, and the waterways and planks of the deck laid and caulked, and the rains prevented from rotting the ends of the beams, and the inside of the ship's timbers, &c. &c.; and it is so simple that it may be executed by the meanest workman that can be called a shipwright. Another very important advantage is, that, in old ships that want repairs, many of the beams are found to be rotten at their ends, parts that always begin to decay first, for the reasons before observed, consequently the fore and aft bolts through the beams can have no security in the rotten part of the beam; so that while the present practice continues of using lodging-knees, it becomes necessary to take out the beams, and replace them with new ones, in which a great deal

deal of time is taken up, and immense expense incurred. This may be completely obviated by having long cheek pieces of timber bolted and fastened to the sides of such beams that are only decayed at the ends; then the tie-pieces C can be morticed by them, and bolted through the ship's side, as before described in Fig. 1. This will not only facilitate the repairs of old ships, but it will at the same time save a prodigious expense. Many other advantages will accompany my methods of connexion, which will be obvious to every one conversant with ship-building.

Specification of the Patent granted to BENJAMIN HADEN, *of the Parish of Sedgley, in the County of Stafford, Bagging-weaver; for an Improvement in the Manufacture of Bagging for packing of Nails, and other Purposes.* Dated February 28, 1803.

TO all to whom these presents shall come, &c. NOW KNOW YE, that in compliance with the said proviso, I the said Benjamin Haden do hereby declare, that my said invention of an improvement in the manufacture of bagging for packing of nails, and other purposes, is described in manner following; that is to say: I take for my warp, hurds, or tow, prepared in the usual way, such as are at present used in making nail-bagging, but for my weft or woofs I take old ropes, or junk, of any dimensions; and after untwisting or dividing the threads or filaments thereof, I wind the same into bobbins or quills, and they then become fit for the shuttle, and I weave them along with the common warp in the common

mon way. I do not confine my invention to bagging for nails, but the same may be used with advantage for bagging for coals, cokes, and for various other purposes, where strength and durability are required, needless to be mentioned here. In witness whereof, &c.

OBSERVATIONS BY THE PATENTEE.

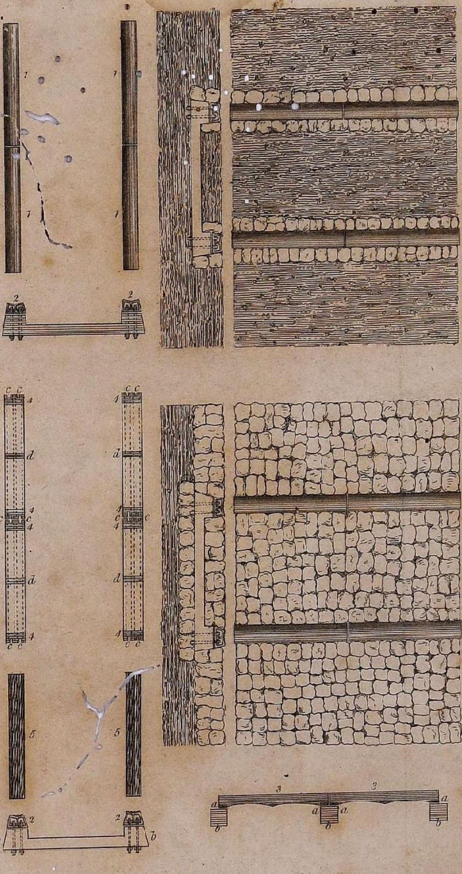
I wish it to be known to those persons who are in the habit of using bagging for which my invention is calculated, that the materials I have described in my specification are peculiarly adapted to give strength and durability to that article. The yarn of which ropes are generally made, particularly king's ropes, is spun from the choicest hemp, and strongly impregnated with tar. The threads taken from the middle of such ropes, not having been exposed either to the weather or to friction, are as sound and as strong as when originally used; and, if not quite equal to new, can be but little inferior. The tarry matter with which these threads are impregnated, renders them peculiarly advantageous in the manufacturing of coal-sacks; the weft being composed of these threads, fine spun, good and strong, adhere firmly to the warp made from hemp in the original way. Sacks made of this cloth are strong, tenacious, and not liable to rent or perish by wet, to which those in present use are particularly subject. The superiority of this invention for nail-bagging is very conspicuous: the weft of those now used is made from the coarsest refuse of flax or hemp that can be procured. The consequence of which is, that the bags frequently perish and burst in carriage, to the great loss of those concerned.

Specification of the Patent granted to JONATHAN WOODHOUSE, *of Ashby-de-la-Zouch, in the County of Leicester, Civil Engineer; for a new Method of forming a Cast Iron Rail, or Plate, which may be used in making Iron Rail Roads, or Trays, for the working and running of Waggons, Drays, and other Carriages, on public and other Roads; and also, a new Method of fixing, fastening, and securing such Cast-Iron Rail, or Plate, on such Roads.* Dated February 28, 1803.

With a Plate.

TO all to whom these presents shall come, &c. NOW KNOW YE, that the said Jonathan Woodhouse, in and by this his instrument in writing, under his hand and seal, pursuant to, and in compliance with, the terms of the said in part recited proviso, doth hereby declare, that the said invention is described in manner following; that is to say: The rail or plate is made of cast-iron, and the upper part or surface thereof is concave: the width of which rail or plate may be increased or diminished as may best suit the size of the wheels of the carriages that may be worked upon the particular roads where the rails or plates are used. The method of fixing, fastening, and securing the cast-iron rails or plates is to place them on bearings, at convenient distances, which are to be fixed firm and solid in the earth, and to fasten the rails or plates to such bearings with wrought-iron screws, or cutter bolts. The bearings for the rails or plates may be made of timber, stone, cast-iron, or wood-piles; and if the rails or plates are properly fixed to such bearings with wrought-iron screws, or cutter bolts, and the road is made even with the surface of the external or outer edges of the rails or plates either with stone

stone, gravel, or wood, or any other road materials, the rails or plates will be immoveable, and the wheels of the carriages used thereon will pass over the same with facility; and, by reason of the concave form and manner of fixing of the said rails or plates, no shock which they can receive (except some wilful force is maliciously used) can injure or break them. Those rails or plates may be used on private as well as on public or other roads, with a great advantage where a multiplicity of business is to be carried on; and by reason of such the concave form, and manner of fixing them, they admit of the wheels of carriages to get upon, or from them, with facility in any direction. And the wheels working on those rails will move with great smoothness and ease. The above or annexed plans or drawings shew the cast-iron rails or plates (see Plate II.); and the method of fixing, fastening, and securing them, of which the following are the explanations. The plans or drawings, numbered 1, shew the upper surface of the rails or plates upon which the different carriage wheels are intended to run. The drawings numbered 2, shew the elevation or end view of the plates or rails, and likewise the concavity of their upper surface, and their form at the ends and sides, and how they are fixed to the bearings. The drawings numbered 3, shew the side view of the rails with the bearings under them. The parts in which drawings marked *a, a, a, a,* shew the ends of the feet, or the bases of the metal which rest on the bearings. And the letters *b, b, b, b, b,* on the drawings numbered 2 and 3, shew the bearings upon which the aforesaid bases or feet rest. The drawings or sections, numbered 4, shew the section of the base or underside of the rails or plates; distinguishing the recesses in the feet of the rails as at *c c, c c, c c, c c, c c, c c.* These recesses are purposely made to receive the


1
2
c
d
4
5
3
a
b

wrought-iron screws or cutter bolts, which serve the double purpose of preserving and securing the cast-iron rails or plates in a direct line with each other, and of firmly securing them on their respective bearings. *d, d, d, d,* in the same drawings or sections, shew the stays cast between the sides of the rails or plates, which brace them together at the bottom edges. The drawings or sections of the plate numbered 5, shew the upper surface of a diced or chequered rail or plate, which will be convenient and proper to be laid in sheets, and where roads meet or cross each other, as they will prevent the horses feet from slipping, and will therefore be more particularly useful in such roads or shoots as have a declivity or descent. The two drawings numbered 6, shew the surface of the iron-rails or plates when fixed in a road or street, where the road or street is paved with stone. The two drawings numbered 7, shew the iron-rails in a public or common road, made with the usual materials of gravel and stone, or other road materials, with this difference, that with a view to keep the rail or plate as free from gravel, sand, and other things as possible, a course of stones is placed on each side of the rail or plate, but which may be used or not, as is found most convenient. And the said Jonathan Woodhouse doth hereby declare and affirm that the particulars, above set forth, do contain a full, true, and perfect description of the nature of the said invention. In witness whereof, &c.

Remarks on the Advantages of Concave Iron Roads. By the Patentee.

Two horses would on this road convey a mail coach more than eight miles *per* hour as easy as the present mails are conveyed six miles *per* hour by four horses.

The conveyance would be so easy that gentlemen might read nearly as well as on board a ship: The even and compact manner in which this road would be laid, would render it the safest of all others, with the additional advantage of using wheels of any diameter. As this road might be kept constantly moist it would have a singular advantage over other iron roads, in keeping the metal perfectly cool, and consequently less friction and wear. It has ever been an object in the projection of canals to bring them as near towns as possible, when, after all, a cartage, or removal, must take place. In bringing a canal near a large town the difficulties and inconveniences are very great, valuable property is wasted, communication (which is very essential) is cut off, the situation for the business is limited, no farther extension can take place; even this may be in a situation where there is an embankment, of course inconvenient to load in and out, or if deep cuttings, the wharfs are then expensive in excavating. This rail-way would waste valuable land near a large town in a trifling comparative degree to a canal, communication would be free, on and over every part of the same; nor would there be any particular limited situation for wharfs or warehouses: hence large towns would derive benefit in every part near which the road would be extended, carriages would not be liable to break down, nor would the wear of tiers, or any part, be put out of order by violent shocks. The easy repairs of carriages on such a road will certainly bear no comparison to those on common roads. The iron rail-ways in use, wherever they are upon and cross a turnpike-road, are inconvenient: these, on the contrary, form not the least impediment.

Specification

Specification of the Patent granted to TIMOTHY COBB, *of Banbury, in the County of Oxford, Woollen-manufacturer; for an Improvement in the Manufacture of a certain Kind of Piece Goods, called Shag or Plush.*

Dated February 21, 1803.

TO all to whom these presents shall come, &c. NOW KNOW YE, that in compliance with the said proviso, I the said Timothy Cobb do hereby declare that my said invention of a certain kind of piece goods, called shag or plush, consists in the combining in the warp called the pole or pile of yarn, made from Spanish or other wool of a short staple, prepared by carding, roving, and spinning, in the common method now used in the manufacture of wool into yarn for weaving into cloth, by which the harshness, inseparable from shags made of the usual materials, is removed, the surface rendered softer, and the article of a more pliable nature.

In witness whereof, &c.

OBSERVATIONS BY THE PATENTEE.

In the article described by the above specification, is combined the finest Spanish wool with cotton, so as to unite the valuable properties of each, and at the same time avoid what is objectionable in goods composed entirely of either. It is not so liable to be soiled, and discharge its colour, as goods made of cotton alone. It possesses the durability of shag without its harshness, having a soft and agreeable surface, besides the great advantage of not shrinking when wet or washed.

Explanation of the Principles on which the Purification of Fish-Oil may be performed, and of the Uses to which it is applicable. By ROBERT DOSSIE, *Esq.*

From the TRANSACTIONS of the SOCIETY for the Encouragement of ARTS, MANUFACTURES, and COMMERCE.

A Premium of 100*l. was voted to Mr* DOSSIE, *for this Communication in the Year* 1761. *It has lately been much enquired after; and is, on that account, now published.*

THAT the fetid smell of fish-oil is chiefly owing to putrefaction, it is unnecessary to shew; but though this be the principal cause, there is another likewise, which is, ustion or burning the oil, occasioned by the strong heat employed for the extracting it from the blubber of the larger fish, and which produces a strong empyreumatic scent that is not always to be equally removed by the same means as the putrid smell, but remains sometimes very prevalent after that is taken away.

In order to the perfect edulcoration of oils, there are consequently two kinds of fœtor or stink to be removed, viz. the putrid and the empyreumatic; and the same means do not always equally avail against both.

The putrid smell of fish-oil is of two kinds; the rancid, which is peculiar to oils; and the common putrid smell, which is the general effect of the putrefaction of animal fluids, or of the vascular solids, when commixed with aqueous fluids.

Fish-oil has not only rancidity, or the first kind of putrid smells peculiar to oils, but also the second or general kinds; as the oil, for the most part, is commixed with the

the gelatinous humour common to, all animals, and some kinds with a proportion of the bile likewise; and those humours putrifying combine their putrid scent with the rancidity of the oil, and, in cases were great heat has been used, with that and the empyreuma also.

The reason of the presence of the gelatinous fluid in fish-oil is this: that the blubber, which consists partly of adipose vesicles, and partly of the membrana cellulosa, which contains the gelatinous fluid, is, for the most part, kept a considerable time before the oil is separated from it, either from the want of convenient opportunities to extract the oil, or in order to the obtaining a larger proportion; as the putrid effervescence which then comes on, rupturing the vesicles, makes the blubber yield a greater quantity of oil than could be extracted before such change was produced; and the vesicles of the tela cellulosa, containing the gelatinous matter, being also burst from the same cause, such matter being then rendered saponaceous by the putrefaction, a part of it mixes intimately with the oil, and constitutes it a compound of the proper oleaginous parts and this heterogeneous fluid.

The presence of the bile in fish-oil is occasioned by its being, in many cases, extracted from the liver of the fish; which is not to be so profitably done by other means as by putrefaction; and the bile being consequently discharged, together with the oil from the vessels of the liver containing them, combines with it, both from the original saponaceous property of the bile, and from that which it acquires by putrefaction.

This holds good particularly of the cod-oil, or common train, brought from Newfoundland; which from its high yellow colour, viscid consistence, and repugnance to burning well in lamps, manifests sensibly the presence of bile and the gelatinous fluid; which latter, by the saponaceous

ceous power of the bile, is commixed in a greater proportion in this than in any other kind of fish-oil.

A tendency to putrify, or at most but in an extremely slow manner, is not an absolute property of perfect oils in a simple or pure state; but it is a relative property dependant upon their accidental contact or commixture with the aqueous fluid. This is evident from the case of oils concreted into a sebaceous form; which being perfectly oleaginous and uncombined with any water, except such as enters into their component parts, will not putrify unless water, or something containing it, is brought in contact with them. But the fluid animal, and most vegetable oils, being compounded of perfect oils with other mixed substances, either sub-oleaginous or gelatinous, have always a putrescence *per se*, or tendency to putrify, without farther admixture of aqueous moisture. This commixture of heterogeneous matter in fish-oil, particularly of the gelatinous fluid and bile, gives rise to a further principle of purification than *simple edulcoration*, or the removing the fœtor; for the presence of such humours in the oil renders it subject to a second putrescence *per se*, supposing the first corrected; makes it unfit for the purpose of the woollen manufacture, as the heat through which this is in some cases employed, causes this matter to contract a most disagreeable empyreuma. It also prevents its burning in lamps, as well from its viscidity as from the repugnance which the presence of water gives to all oleaginous matter. It is therefore necessary to free the oil from this heterogeneous matter; after which it can be subject only to the rancid putrescence, or that which is proper to oils as such.

The substances which have been or may be applied to the removing or preventing the effects of putrescence, are, acids, alkalies, metallic calces, neutral salts, ethe-

real

real and essential oils, vinous spirits, water, and air. With respect to acids, though they may be applied with effect to the removal or, prevention of putrefaction in mixed, animal, and vegetable substances, yet they have not the same efficacy when employed in the case of oils; for in a small proportion, without the subsequent aid of alkalies, they rather increase than diminish the fœtor, and in a large proportion they coagulate the oils, and change their other properties as well as their consistence. Though they might therefore be employed with the assistance of alkalies, yet requiring a more expensive and complex process, and not being moreover necessary, as the same end may be obtained by the use of alkalies only, they may be deemed improper for the purification of animal oils for commercial purposes. Alkaline substances, both salts and earths, are the most powerful instruments in the edulcoration of oils; but as their action on putrid oils, and the method of applying them to this end, are not the same in both, it is proper to consider them distinctly.

Of alkaline salts it is the fixed kind only which are proper to be used for the edulcoration of oils. Fixed alkaline salts, in a dissolved state, being commixed with putrifying animal substances, appear to combine with the putrid matter, and mixing with some of the principles, form instantly volatile alkaline salts. On the less putrid they seem to act, after their combination, by an acceleration of the putrescent action, till they attain the degree which produces volatile salts. This is evident by the sensible putrid ferment and smell which appear after their commixture; but which gradually abating, the oil is rendered sweeter, much lighter-coloured, and thinner.

Their great use in the edulcoration of fish-oil arises, therefore, from their converting such parts of the gela-

tinous

tinous fluid and bile as are highly putrified instantly into volatile salts, and causing a rapid putrefaction of the other parts; by which means the oil is freed from them by their dissipation. They do not, however, equally act on the parts of the oil on which the empyreumatic scent depends, unless by the assistance of heat; for when they are commixed with the oils without heat, in proportion as the putrid smell diminishes, that becomes more sensibly prevalent. The ultimate action of lixiviate salts on animal oils, except with respect to the empyreuma, seems to be the same either with or without the medium of heat; for the same urinous and putrid smell, gradual diminution of the colour, and fetid scent, happens in one case as in the other, except with regard to the acceleration of the changes; and such salts, where the purification is required to be made in a great degree, are a necessary means, as they are more effectual than any other substance that can be employed.

The use of lixiviate salts alone is not, however, the most expedient method that can be pursued for the edulcoration of oils, for several reasons. If they be used alone, cold, in the requisite proportions, they coagulate a considerable part of the oil, which will not again separate from them under a very great length of time; and when they have destroyed the putrid scent, a strong bitter empyreumatic smell remains. The same inconvenience, with relation to the coagulation of part of the oil, results when they are used alone with heat. The super-addition of common salt, (which resolves the coagulum and counteracts the saponaceous power of the lixiviate salt, by which the oil and water are made to combine) is therefore necessary: and the expense arising from the larger proportion of lixiviate salt, requires it to be employed if no other alkali be taken in aid, and renders

ders the junction of alkaline earths with it extremely proper in the edulcoration of oils for commercial uses. Lime has also an edulcorative power on animal oils; but it has also so strong a coagulative action, that the addition of a large proportion of alkaline salts becomes, when it is used, necessary to reduce the concreted oil to a fluid state; and therefore this substance alone is not proper for that purpose. The combination of lixiviate salt with lime, or the solution commonly called soap-lye, has an effectual edulcorative action of fetid oils; but it makes a troublesome coagulation of part of the oil, if no common salt be employed, and must be used in such large proportion, if no alkaline earth be added, as renders the method too expensive.

Lime has a power of combining with and absorbing the putrid parts of the gelatinous fluid and bile, when commixed with oil; and effects, either with or without heat, a considerable edulcoration of fetid oils; but it combines so strongly with them, either cold or hot, that the separation is difficult to be effected, even with the addition of brine; and the oil, when a large proportion of it is used, can scarcely be at all brought from its concreted to a fluid state, but by an equivalent large proportion of lixiviate salt: the use of lime therefore, alone, is improper, or even in a great proportion with other ingredients. But when only a lesser degree of edulcoration is required, a moderate quantity, conjoined with an equal or greater weight of chalk, which assists its separation from the oil, may, on account of its great cheapness, be employed very advantageously: it will in this case admit of precipitation from the oil by the addition of brine. It may be also expediently used, when lixiviate salt is employed with heat for the most perfect purification of oils; for it will in that case give room for the diminishing of the

quantity of lixiviate salt, though the proportion be nevertheless so restrained as not to exceed what the proportion of lixiviate salt (just requisite for the edulcoration) can separate from the oil.

Chalk has an absorbing power similar to lime, but in a less degree, on the putrid substance of oil; it does not, however, combine so strongly with the oil as to resist separation in the same manner, and is therefore very proper to be conjoined either with lixiviate salts or lime, as it renders a less quantity of either sufficient, and indeed contributes to the separation of the oil from them.

Magnesia alba or the alkaline earth which is the basis of the sal catharticus, and the singular earth which is the basis of alum, both have an edulcorating power on fetid oils; but, like lime, have too strong an attraction with them to be separated so as to admit of the reduction of the oil from the concreted state to which they reduce it; and therefore, as they are not superior in efficacy to lime and chalk, but much dearer or more difficult to be obtained, they may be rejected from the number of ingredients that are proper for the purifying of oils, with a view to commercial advantages.

Sea-salt has an antiseptic power on the mixed, solid parts of animals; but used alone, or dissolved in water, it does not appear to lessen the putrid fœtor of oils, but on the contrary rather increases it. If, after their commixture with it, they are subjected to heat, it rather depraves than improves the oils; but though by its own immediate action on them it conduces so little to the edulcoration of oils, yet it is a medium for the separation of water, and the alkaline substances requisite to be employed to that end. It is of great utility in the edulcorative processes: for when alkaline salts or earths combine with the water necessary to their action on the oils, or them-

themselves form coagulums or corrections with it, a solution of salt will loosen the bond and dissolve the close union; so that the oil being separated will float on the aqueous fluid, while the earth, if any be in the mixture, will be precipitated and sink close together to the bottom of the containing vessel.

Sal catharticus, Glauber's salt, nitrum vitriolatum, tartar, and other neutral salts, though they counteract putrefaction in the mixed or solid parts of animals, seem to have little effect on oils with respect to their edulcoration, and cannot therefore be ranked amongst the substances proper to be used for that purpose.

Lead reduced to the state of a calx, either in the form of minium or litharge, has a strong edulcorative power on fetid oils, and is indeed applied to that end, with respect to one kind of vegetable oil, for a very bad purpose, considering its malignant qualities on the human body.

In the case of train-oil, which will scarcely ever be considered among the esculent kinds in this country, the same objection against its use would not lie; and employed either with or without heat, it is a powerful absorbent both of the putrid and empyreumatic parts that occasion the fœtor.

As however there may be some prejudice against its use, even in any way, and as it is not absolutely necessary, I have not given it a place among the ingredients of the processes I recommend.

The ochrous earth of iron, commonly called red ochre, has an absorbing power on the putrid parts of oil, but combines so strongly, that the separation is tedious even with the addition of brine; if, nevertheless, it be added when chalk and lime have been some time commixed with the oil, as in process the first, it will promote the edul-

corative intention, and will subside along with them; and, as it has some advantage without increasing the expense, unless in the most inconsiderable degree, its use may be expediently admitted in that process.

Essential and ethereal oils are applicable to the prevention of putrefaction in the mixed and solid parts of vegetables, but are not so to the edulcoration of fetid oils; and if they had the desired effect, they would not, on account of their price, answer the commercial end, unless the due effect was produced by adding them to the oils in a very small quantity.

The same holds good of spirit of wine as of essential and etherial oils, both with respect to their efficacy and the expense.

Water has an edulcorative action on fetid oils, by carrying off the most putrid parts of the gelatinous fluid or bile, in which, as was above explained, the principal fœter resides, if the quantity added be large, and an intimate commixture be made of them by stirring them together for a considerable time: this only partially removing those heterogeneous putrescent substances, the remaining part soon acquires the same state, and the oil again grows fetid, though not to the same degree as before.

Water is, however, a necessary medium for the action of salts and the separation of alkaline earths and calces of metals, when they are employed for the edulcoration of oils, as will appear from a consideration of my processes.

Air edulcorates oil by carrying off the most putrid parts, which are necessarily extremely volatile. It may be made to act on them either by simple exposure of them to it, with a large extent of surface, or by forcing it through them by means of ventilators, as has been practised

practised by some dealers; but is now, I believe, neglected on account of their finding the improvement of oils by it not adequate to the trouble, as the gelatinous matter and bile, not reduced to a certain degree of putrefaction, being left behind, putrify again to nearly the same degree as before.

It appears from these several observations, that the cheapest ingredients which can be used for the edulcoration of train-oils, are lime and chalk, which may, with the addition of a proper quantity of solution of sea-salt or brine, be made to procure a separation of them from the oils, according to process the first, so as to answer for some purposes; that the lixiviate salt is the most powerful purifier of oils, and, with the assistance of chalk and brine, will, without heat, according to process the second, effect a very considerable degree of edulcoration; and that lixiviate salt used with heat, with the addition of lime and chalk, to save a part of the quantity which would otherwise be necessary, and of brine to procure a a quick separation, will perform an edulcoration sufficient for all commercial purposes, according to process the third; but that calcined lead and the ochrous earth of iron may, perhaps, be applied in some cases with advantage, where the oil is not designed for esculent use.

Process the First. — *For purifying Fish-Oil in a moderate Degree, and at a very little Expense.*

Take an ounce of chalk in powder, and half an ounce of lime slacked by exposure to the air; put them into a gallon of stinking oil, and having mixed them well together by stirring, add half a pint of water, and mix that also with them by the same means. When they have stood an hour or two, repeat the stirring, and continue the same treatment at convenient intervals for two or three

three days; after which, superadd a pint and a half of water, in which an ounce of salt is dissolved, and mix them as the other ingredients, repeating the stirring, as before, for a day or two. Let the whole then stand at rest, and the water will sink below the oil, and the chalk subside in it to the bottom of the vessel. The oil will become clear, be of a lighter colour, and have considerably less smell; but will not be purified in a manner equal to what is effected by the other processes below given; though, as this is done with the expense of only one ounce of salt, it may be practised advantageously for many purposes, especially as a preparation for the next method, the operation of which will be thereby facilitated.

PROCESS THE SECOND. — *To purify, to a great Degree, Fish-Oil without Heat.*

Take a gallon of crude stinking oil, or rather such as has been prepared as above mentioned, and add to it an ounce of powdered chalk; stir them well together several times, as in the preceding process; and after they have been mixed some hours, or a whole day, add an ounce of pearl-ashes, dissolved in four ounces of water, and repeat the stirring as before. After they have been so treated for some hours, put in a pint of water, in which two ounces of salt are dissolved, and proceed as before: the oil and brine will separate on standing some days, and the oil will be greatly improved both in smell and colour. Where a greater purity is required, the quantity of pearl-ashes must be increased, and the time before the addition of the salt and water prolonged.

If the same operation is repeated several times, diminishing each time the quantity of ingredients one-half, the oil may be brought to a very light colour, and rendered

dered equally sweet in smell with the common spermaceti oil.

By this process the cod-oil may be made to burn; and, when it is so putrid as not to be fit for any use, either alone or mixed, it may be so corrected by the first part of the process, as to be equal to that commonly sold: but where this process is practised in the case of such putrid oil, use half an ounce of chalk and half an ounce of lime.

PROCESS THE THIRD.—*To purify Fish-Oil with the Assistance of Heat, where the greatest Purity is required, and particularly for the Woollen Manufacture.*

Take a gallon of crude stinking oil, and mix with it a quarter of an ounce of powdered chalk, a quarter of an ounce of lime, slacked in the air, and half a pint of water; stir them together; and when they have stood some hours, add a pint of water and two ounces of pearl-ashes, and place them over a fire that will just keep them simmering, till the oil appears of a light amber colour, and has lost all smell except a hot, greasy, soap-like scent. Then superadd half a pint of water in which an ounce of salt has been dissolved; and having boiled them half an hour, pour them into a proper vessel, and let them stand till the separation of the oil, water, and lime be made, as in the preceding process. Where this operation is performed to prepare oil for the woollen manufacture, the salt may be omitted; but the separation of the lime from the oil will be slower, and a longer boiling will be necessary.

If the oil be required yet more pure, treat it, after it is separated from the water, &c. according to the second process, with an ounce of chalk, a quarter of an ounce of pearl-ashes, and half an ounce of salt.

Observations on Process the First.

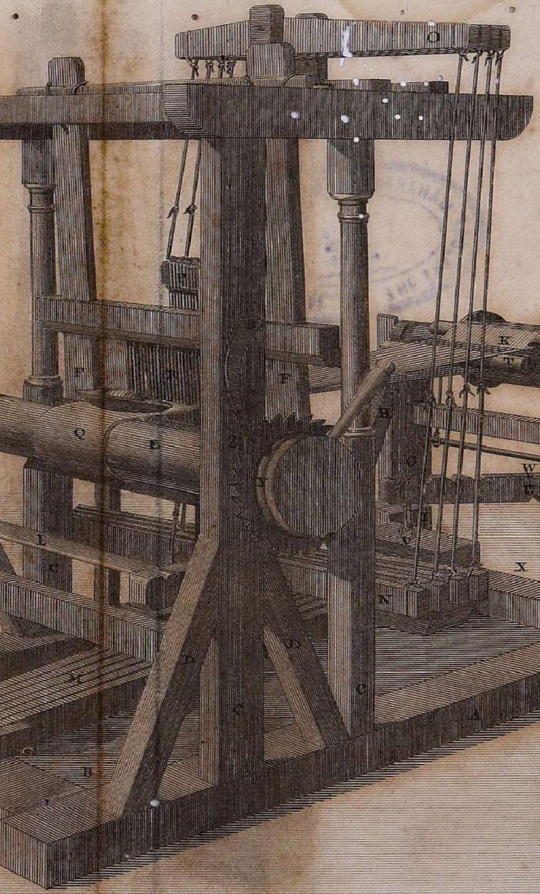
This process may be performed on any kind of fish or seal-oil that is putrid and stinking, and will improve it in smell, and generally render the colour lighter, if previously dark and brown: it will also conduce to render these oils fitter for burning, which are, in their crude state, faulty in that point; but it will not meliorate them to the full degree they admit of even without heat, and should therefore be practised when only a moderate improvement is required.

Secondly. When the oil is taken off from the dregs and brine, the dregs which swim on the brine should be taken off it also, and put into another vessel of a deep form; and on standing, particularly if fresh water be added and stirred with them, nearly the whole remaining part of the oil will separate from the foulness; or, to save this trouble, the dregs, when taken off, may be put to any future quantity of oil that is to be edulcorated by this method, which will answer the same purpose.

Observations on Process the Third.

First. — This is most advantageously performed on train-oil, called vicious whale-oil; and the more putrid and foul it may be, the greater will be the proportionable improvement, especially if there be no mixture of the other kinds of fish-oils, particularly the seal, which do not admit of being edulcorated perfectly by means of heat, but require other methods: but when the vicious oil is pure from admixture of others, however stinking it may be, the bad smell will be removed by this process duly executed, and the brown colour changed to a very light amber; and these qualities will be much more per-

manent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manent in this than in any crude oil, as it will not, from the degree of purity to which it is brought, be subject to putrify again under a great length of time, whether it be kept open or in close vessels.

The oil in this state will burn away without leaving the least remains of foulness in the lamp; and, being rendered more fluid than before, will go farther, when used in the woollen manufacture, than any other kind, and will be much more easily scoured from the wool.

If nevertheless there be any branches of the woollen manufacture which require the use of a more thick and unctuous oil, this may be rendered so by the addition of a proper quantity of tallow or fat, of which a certain proportion will perfectly incorporate with the oil, the fluidity and transparency being still preserved, as well as all the other qualities that render it suitable to the intended purpose. This may be most beneficially done by adding a proper quantity of the refuse grease of families, commonly called *kitchen-stuff*, which being put to the oil, when moderately heated, will immediately dissolve in it, and let fall also its impurities or foulness to the bottom of the vessel, and render the purified admixture a considerable saving to the manufacturers.

Secondly.—The different qualities and dispositions of different parcels of vicious oil with respect to edulcoration, render various proportions necessary of the ingredients to be used. The quantities stated in the above process are the least which will effect the end in general, and frequently greater will be required; but this may always be first tried; and if it be found, after six or eight hours simmering of the mixture, that no gradual improvement is making in the smell and colour, but that the oil continues the same in those particulars, and remains also mixed with the chalk and lime, and in a thick turbid

 state,

state, a fourth or third part of the first quantity of pearl-ashes should be added, and the simmering continued till the oil be perfect. As the quantity of the water is lessened by the evaporation, it is necessary to make fresh additions from time to time, that there may be always nearly the original proportion.

Thirdly.—If it be inconvenient to give the whole time of boiling at once, the fire may be suffered to go out and be re-kindled at any distance of time; and if, in such case, a small proportion of pearl-ashes dissolved in water be added, and the mixture several times stirred betwixt the times of boiling, it will facilitate the operation. The time of boiling may be also much shortened if the chalk, lime, and pearl ashes, be added for some days before, and the mixture frequently stirred.

PROCESS THE FOURTH, —*which may be practised alone, instead of Process the First, as it will edulcorate and purify Fish-Oil to a considerable Degree, so as to answer most Purposes, and for Process the Third, when the whole is performed.*

Take a gallon of crude stinking oil, and put to it a pint of water poured off from two ounces of lime slacked in the air; let them stand together, and stir them up several times for the first twenty-four hours; then let them stand a day, and the lime-water will sink below the oil, which must be carefully separated from them. Take this oil, if not sufficiently purified for your purpose, and treat it as directed in process the third, diminishing the quantity of pearl-ashes to one ounce, and omitting the lime and chalk *.

* The dregs remaining after the sundry processes above mentioned, will form an excellent manure, as has been since noticed in Dr. Hunter's Georgical Essays.

Description of an improved Loom applicable to the weaving of Purses, Pockets, and Sacks; and of a Method of setting up Looms of all Kinds, so as to do their Work better than in the common Way.

By Mr. THOMAS CLULOW, *of Old Cock-lane, Shoreditch.*

With a Plate.

From the TRANSACTIONS of the SOCIETY for the Encouragement of ARTS, MANUFACTURES, and COMMERCE.

A Bounty of Twenty-five Guineas was voted to Mr. Clulow *for these Inventions.*

AN oblong frame A (see Plate III.) is laid down horizontally, and secured at the four corners with triangular braces B, B, B, B, to keep the frame properly square.

Four posts C, C, C, C, are fixed upright in mortise-holes on the above frame. The front posts are supported both back and front with diagonal timbers D, D, D, D, to keep the breast roll E from giving way in the least by the heavy stroke of the batten F F on the quarter or work: the two hinder posts G, G, are held firm by two diagonal supports H, H, within the loom, to bear against the counter weights I, I, and the great weight V, hanging on the work K, and the force of the batten F.

In a loom constructed on this plan, both strong and slight works may be made firm and good, without the loom having any shorings or supports; the advantages arising from which are the following, *viz.*

Poor indigent weavers being obliged to live in low-rented houses, the floors and party walls of the rooms where they weave are bad and weak, so that the common looms cannot be placed firm, and a man is perplexed to set up his loom in requisite order. If the loom be not set

 up

up firm, and secured from giving way in the working of it, no work can be made strong and good. One great disadvantage is done away by the bottom frame that I use for fixing my loom upon, which can be placed by any common workman; whereas to set a loom up in the old method, requires great exactness and judgment to prevent the work from being damaged.

If, in the common way, a loom be not properly put in the square, and firmly shored, which it is difficult to do, the silk chases and cuts, the mind of the workman is harrassed for want of knowing the real cause of it, or having sufficient knowledge to correct it; therefore the work is spoiled for want of a trifling alteration in the loom, and the blame frequently laid upon the silk when the error lies wholly in the loom.

If a common loom be put in its proper square, and has not a firm shoring or support, the work or cloth has not the firmness which it ought to have, and which it will have in my method. It frequently happens that the shorings or supports are too long and slender, or the places weak which they are fixed against, which causes a trembling motion in the loom; and if the loom shakes only the 100th part of an inch (which is not more on a moderate calculation than the breadth of each thread shot into the work) it will take out that stiffness there ought to be in the work; for if the loom does not stand firm against the stroke of the batten, the work will lie hollow, be flimsy, and though it takes as much silk as good work, it does not look well, nor will sell for so much money: the poor weaver is therefore turned out of employment, not knowing where the error lies; and the employer suffers in his property.

If the shores to the common looms, after being placed, either fall by accident or through the continual shaking

of the loom whilst working, which circumstances will sometimes happen in the middle of a piece of work being done, it is with great difficulty that the loom can then be put in square, or supported as it ought to be; therefore it occasions the work to be spoiled.

Besides these, other difficulties frequently occur to a weaver where the loom is not properly fixed, squared, and shored, which those persons conversant in weaving well know. I shall mention one material instance, where, if the loom is originally well set up in the common way, it may be liable to great disadvantage, *viz.* its situation in regard to light, which is a main point, as in that case it cannot be moved without great risk, if any work is in it; whereas, if the loom is made according *to my model*, the weaver may slide it to any exactness that is requisite, as a few inches moving will permit the light to fall on the work properly without injury to the work, as my loom is firm and squared, without requiring the aid of any shores.

Articles wove in this loom will be less liable to lose their contents than those whose seams are sowed with the needle, and be less liable to want repairs.

Method of weaving Sacks, &c. in the Loom abovementioned.

L, the seat of the loom.

M, the treadles, six in number, to raise the harness.

N, the counter-meshes to raise the tumblers O, moveable on a pin a little beyond their centre, and which act on the harness P, by raising such parts thereof as they are attached to at their extremities.

Q, the work in the loom.

R, the reed which strikes the shoot or weft close up.

S, the back beam on which the warp or thread is wound.

T, T,

T, T, the rods to preserve the crossing of the threads.

V, the main weight suspended by a lever U, from a bar W near its centre; the other end of the lever is fastened by a cord to the bottom frame of the loom at X.

Y, the rack on the working beam.

Z, the catch to hold the teeth of the rack.

To weave a sack, press down the second treadle on the right-hand side, and throw one shoot with the shuttle; then press down the second treadle on the left-hand side, and throw another shoot; then proceed in the same manner with the third on the right and the third on the left, till a sufficient quantity is made; then work the two outside treadles and two shoots.

In weaving sacks, it is necessary between the finishing of one sack and the commencement of another, to pass a thin slip of wood through the threads, in order to form a space between the two sacks.

Observations on the Means of enabling a Cottager to keep a Cow by the Produce of a small Portion of Arable Land.

From Essays on Miscellaneous Subjects.

By Sir John Sinclair, *Bart.*

THE following paper was drawn up for the consideration of the Board of Agriculture, who, in consequence of the observations therein stated, and the great importance of the subject, came to the following resolution:

Resolved, (June 9th, 1801,) that a premium of the gold medal be offered to each of the five persons, who shall, in the most satisfactory manner, prove by experiment, the practicability of cottagers being enabled to keep

keep one or two milch cows, on the produce of land cultivated with the spade and hoe only, and who shall send to the board, on or before the 1st of January, 1803, the best accounts of such experiments, detailing,

1. The expense of erecting the cottage, shed, and any other building thought necessary.

2. The expense of providing the stock and tools necessary.

3. The extent of land, and nature of the soil occupied.

4. The expense of digging and fencing the land.

5. The rent, taxes, &c. paid for the same by the cottager.

6. The course of cropping that has been adopted.

7. The quantity and value of each of the different crops.

8. How the cottager and his family are maintained, and how they manage to cultivate the ground, and to harvest the different crops.

9. How the cow is maintained during the year, and what profit is derived from it.

10. What profit is derived from pigs, poultry, and other articles.

11. How many days they were enabled to labour for other people. And,

12. How, on the whole, the plan has been found to answer?

IN several parts of the kingdom, as in Lincolnshire, Rutlandshire, &c. which are calculated for grazing, it is not unusual to give industrious cottagers as much land as will enable them to keep a cow, and sometimes two, or more, besides other stock; and it appears from the communications of Lord Winchelsea and others, to the Board of Agriculture, from the publications of the society

society for bettering the condition of the poor, and from a late interesting work printed by Mr. Arthur Young *, that such a system is productive of the happiest consequences. It is supposed, however, to be totally inapplicable to an arable district. I trust that such an opinion will not be admitted, without full consideration. Indeed, so far as I can judge, this advantageous system is to the full as well adapted for the one district as for the other. It requires unquestionably more labour on the part of the cottager, and of his family; at the same time, the occupation of so great an extent of ground is not so necessary in arable, as in grazing, countries; a circumstance, in various respects, extremely material.

In arranging the following plan, (which the reader will please to consider, merely as furnishing an outline, to be perfected by farther discussion and experiment), it is proposed to keep in view the following principles:

1. That the cottager shall raise, by his own labour, some of the most material articles of subsistence for himself and his family.

2. That he shall be enabled to supply the adjoining markets with the smaller agricultural productions; and,

3. That both he and his family, shall have it in their power to assist the neighbouring farmers, at all seasons of the year, almost equally as well as if they had no land in their occupation.

It can hardly be questioned, that, if it were practicable to have a number of cottagers of that description, in every parish, it would promote, in various respects, the interests of the public.

* Intituled, "An Inquiry into the Propriety of applying Wastes to "the better Maintenance and Support of the Poor."

1. *Extent*

I. *Extent of Land necessary.*

Unless the experiment were fairly tried, it is impossible to state exactly the extent of arable land requisite to enable a cottager to raise the articles generally necessary for the sustenance of himself and family, and to keep a cow, some pigs, and poultry. Much must depend upon the natural richness of the soil (though under the management about to be proposed, almost any soil would in time become fertile); on the nature of the climate; on the size of the cow; on the industry of the cottager; on the age and number of his family, &c. But I should imagine, that three statute acres and a quarter of good arable land, worth from 20*s.* to 30*s. per* acre, would be sufficient. It is proposed, that the three acres shall be under a regular course of cropping. The quarter of an acre ought, if possible, to be converted into an orchard, where the cow might occasionally pasture, and where a pond ought to be kept in good order, that it may have plenty of water at command. Were the land of a quality fit for lucerne, perhaps two acres and a quarter might be sufficient.

II. *Stock and Instruments of Husbandry.*

It is evident, that so small an extent of land, as either two or three acres, under cultivation, excludes all idea of ploughing *, and indeed, unless the cottager shall manage the whole, in the simplest and cheapest manner, there is an end to the whole system. It would require, indeed, four or five acres to keep a single horse, and the expense of purchasing horses, or even oxen, ploughs, and

* Ploughs might perhaps be hired; but, on the whole, the spade-culture is infinitely preferable, and I would much rather see a cottager hire persons to trench than to plough for him.

other instruments of husbandry, must be far beyond the abilities of a cottager; whereas with a spade, a hoe, a rake, a scythe, a sickle, and a flail, which are all the instruments really necessary, he is perfectly competent to the management of his little farm.

III. *Course of Crops, &c.*

The three acres, proposed to be cultivated, should be divided into four portions, each consisting of three roods, under the following system of management:

	Roods.
Under potatoes, 2 roods, under turnips, one *	3
Under winter tares, 2 roods, spring tares, one	3
Under barley, wheat, or oats	3
Under clover, with a mixture of rye-grass †	3
Total	12 Roods.

Other articles besides these might be mentioned, but it seems to me of peculiar importance to restrict the attention of the cottager to as few objects of cultivation as possible.

It is proposed, that the produce of the two roods of potatoes shall go to the maintenance of the cottager and his family ‡; and that the rood of turnips should be given

* I would also recommend a small quantity of flax, where the culture and management of the plant was known, to employ the females, particularly in winter, and to supply the family with linen.

† Some recommend the proportion, *per* acre, to be at the rate of one bushel of rye-grass to 12 lbs. of red-clover; others 14 lbs. of red-clover to half a bushel of rye-grass.

‡ By Sir John Methuen Poore's experiments, it was found that half a rood, or one-eighth of an acre, produced, for several years, as great a weight of potatoes as was sufficient for a family of four persons.— Four acres answered for 131 persons.

to

to the cow in winter, and during the spring, in addition to its other fare.

The second portion, sown with tares, (the two roods of potatoes of the former year, to be successively sown with winter tares, and the turnip rood with spring tares,) might partly be cut green, for feeding the cow in summer and autumn, but, if the season will permit, the whole ought to be made into hay for the winter and spring feed, and three roods of clover cut green for summer food.

The third portion may be sown either with barley, wheat, or oats, according to the soil or climate, and the general custom of the country. The straw of any of these crops would be of essential service for littering the cow, but would be still more useful, if cut into chaff, for feeding it.

The fourth portion, appropriated to clover and rye-grass, to be cut green, which, with the assistance of the orchard, will produce, on three roods of land, as much food as will maintain a cow and her calf for five months, namely, from the end of May, or beginning of June, when it may be first cut, to the beginning of November, besides some food for the pigs. It is supposed, that an acre of clover and rye-grass, cut green, will produce 20,000 lbs. weight of food for cattle. Three roods therefore ought to yield 15,000 lbs. weight. A large cow requires 110 lbs. weight of green food *per* day; a middling sized cow, such as a cottager is likely to purchase, not above 90 lbs.; consequently, in five months, allowing 1,320 lbs. weight for the calf and the pigs, there will remain 13,680 lbs. for the cow *. Were there, however,

* These calculations are merely given as data for experiment. It must depend upon the season, whether the tares or the clover should be made into hay.

even a small deficiency, it would be more than compensated by the rood of land proposed to be kept in perpetual pasture as an orchard.

IV. *Mode in which the Family may be maintained.*

It is calculated, that three roods and eight perches of potatoes will maintain a small family of six persons, for about nine months in the year; but, according to the preceding plan, it is proposed to have but two roods under that article; for however valuable potatoes are justly accounted, yet some change of food would be acceptable; and the cottager will be enabled, from the produce of the cow, and by the income derived from his own labour, and from that of his family, to purchase other wholesome articles of provision.

V. *Manner in which the Stock may be kept.*

It appears from the preceding system of cropping, that ten roods of land, or two acres and a half, are appropriated to the raising of food for the cow in summer and winter, besides the pasture of the orchard; and unless the season should be extremely unfavourable, the produce will be found not only adequate to that purpose, but also to maintain the calf for some time, till it can be sold to advantage. It is indeed extremely material, under the proposed system, to make as much profit of the calves as possible, as the money thus raised will be a resource enabling the cottager to replace his cow, when a new one must be purchased.

For the winter provision of the cow, which is the most material, because summer food can be more easily procured, there is the produce,

1. Of about three roods of tares, or clover, made into hay.

2. Of

2. Of three roods of straw, deducting what may be necessary for litter; and if dry earth be put into the cow's hovel, and removed from time to time to the dung-hill, little or no litter will be necessary.

3. Of one rood of turnips.

The whole will be sufficient for seven months in the year, namely, from the 1st November to the 1st June; and during the remaining five months, the pasture of the orchard, some of the winter tares, and the produce of three roods of tares, or clover and rye-grass, will not only suffice, but will furnish a surplus for the calf, if it is kept for any length of time *, and some tares or clover for the pigs.

The inferior barley, potatoes, &c. will of course be given to the pigs and the poultry.

VI. *Value of the Produce.*

The land thus managed, will certainly produce, by means of the extra industry of the family, and at a small expense, a most important addition to the income which the cottager may derive from his ordinary labour. For instance,

* In a pamphlet just published by Richardson, Cornhill, on the culture of potatoes, price 1s. the following mode of applying the refuse potatoes, to the feeding of calves, is strongly recommended.

"Take two gallons of small potatoes, wash them clean, put them "into a pot of boiling water sufficient to cover them, and let them "boil till the whole becomes a pulp: then add more water, and run "the whole through a hair sieve, which will produce a strong nutri-"tive gruel. At first use a very small quantity, warmed up with "milk, to make it palatable to the calf, and increase the quantity "daily, till it becomes equal. A quart of potatoe gruel, and a quart "of scald or skimmed milk, will be sufficient for a good meal, which "should be given warm three times a day."

1. The

	per Annum.		
	£.	s.	d.
1. The orchard (after the trees become fruitful) will probably yield	1	10	0
2. Three roods of turnips and potatoes . . .	4	0	0
3. Eighteen bushels of barley, at 4 *s.* . . .	3	12	0
4. The cow and calf *	7	0	0
5. Hogs	3	0	0
6. Poultry and eggs	2	0	0
Total . . .	£.21	2	0

Where wheat can be raised instead of barley, the profit would be still more considerable. Opinions will differ much, regarding the value put on each article, but that is of little consequence, as the total cannot be accounted too high.

VII. *Time required for cultivating the Land.*

The quantity of land intended to be cultivated, will not materially interfere with the usual labour of the cottager. It will only require to be dug once, and is then fit to be cropped. It is proposed, that only nine roods shall be annually cultivated, (the remaining three roods being under clover and rye-grass,) and nine roods may be dug in the space of about 558 hours, or at the rate of 62 hours per rood. This might be done at bye hours (more especially when the family of the cottager shall be somewhat advanced, and consequently more able to furnish assistance); but supposing that the digging, manuring, harvesting, &c. will require twenty entire days *per*

* According to Mr. Kent's calculations, a cow should produce six quarts of milk *per* day, worth 1*d. per* quart, equal to 3*s.* 6*d.* a week, or 9*l.* 2*s. per annum*, setting the profit of the calf against the loss sustained when the cow is dry: but it is better to be rather under than over the mark.

annum,

annum, in addition to the bye hours, and allowing sixty days for Sundays and Holidays, there will remain 285 days, for the ordinary hand labour of the cottager, which, at 1*s.* 6*d.* *per* day, would amount to 21*l.* 7*s.* 6*d.*; the earnings of the wife and children, may, at an average, be worth at least 4*l.* *per annum* more. This is certainly a low calculation, considering how much may be got during the hay and corn harvests: but even at that moderate estimate, the total income of the family will be as follows:

		£.	s.	d.
1. Produce of the farm	- -	21	2	0
2. Labour of the cottager	- -	21	7	6
3. Earnings of the family	- -	4	0	0
	Total	46	9	6

VIII. *Buildings.*

It is impossible to calculate the expense of building a cottage, as so much depends upon its size, the place where it is situated, the materials of which it is composed, the price of labour in the country, and a variety of other circumstances. On this important subject, much useful information is contained in the first volume of the Communications published by the Board of Agriculture. But it is proper to observe, that no expensive additional buildings will be necessary, in consequence of the proposed system. A shed or hovel for the cow cannot occasion any very heavy charge, and a small barn, of the simplest and cheapest construction, may be of use, not only for threshing the crop, but also for securing the hay, and making it to more advantage, in case the season should prove unfavourable; if the corn is put up in small stacks, the barn may be made of very moderate dimensions.

IX. *Rent, and Balance of Income.*

The rents of cottages, and of land, vary so much in different parts of the kingdom, that it is difficult to ascertain an average. But if the cottage shall be stated at 3 *l. per annum*, the land at 25*s. per* acre, and the orchard at 10 *s.* the whole will not exceed 7 *l.* 15 *s.* The cottager will also be liable to the payment of some taxes, say to the amount of 1*l.* 5*s.* more. Hence the total deductions would be about 9*l.* leaving a balance in favour of the cottager of 37 *l.* 9 *s.* 6 *d.* Considering the cheap rate at which he is furnished with a quantity of potatoes, equal to several months' consumption, and with milk for his children, surely, with that balance, he can find no difficulty, not only in maintaining himself and family in a style of comfort, but also in placing out his children properly, and laying up a small annual surplus, that will render any parish assistance, whether in sickness or old age, unnecessary; and thus he will be enabled to preserve that manly and independent spirit, which it so well becomes a British cottager to possess *.

CONCLUSION.

Advantages of the proposed System.

I shall now endeavour briefly to explain some of the advantages which may be looked for with confidence, from the proposed system.

In the first place, the land possessed by the cottager would be completely cultivated, and rendered as productive as possible. The dung produced by the cow, the

* The different expense of fuel, in the various districts, will, it is evident, greatly affect the annual surplus.

pigs,

pigs, &c. would be amply sufficient for the three roods under turnips and potatoes; which would afterwards produce, 1, Tares; 2, Barley; and, 3, Clover; with a mixture of rye-grass, in regular succession, without any additional manure. The barley should yield at least 18 bushels, besides 3 bushels for seed; and if wheat or oats are cultivated, in the same proportion. The milk, deducting what may be necessary for the calf, and for the cottager's family, might be sold in its original state, if there shall be a market for it, or converted into butter, for the purpose of supplying the neighbouring towns or villages. Such cottagers also might certainly send to market both eggs and poultry.

2. It is hardly possible to suggest a measure more likely to promote the benefit of a numerous and valuable body of people. The system of keeping cows by cottagers, which has been found so advantageous in the grazing districts, may thus be extended over the whole kingdom; and indeed, if the above plan is found to answer, in place of four or five acres employed in feeding a single cow, it would be much better, even in the grazing counties, to restrict the land to a smaller quantity, under a tillage-mode of management; for thus not only the cow, but also the cottager himself and his family, would, in a great measure, be maintained by a less surface of soil.

3. It is of infinite consequence to establish the practicability of this system, as the means of removing a most unfortunate obstacle to the improvement of the country. It is well known to be the only popular objection to the inclosure of our wastes and commons, that, while uninclosed, a number of cottagers are enabled to keep cows, by the means of their common-rights, and that their cows

 disappear

disappear when the commons are inclosed. But if so small a portion of land as 3¼ acres, when improved and properly cultivated, can enable a cottager to keep a cow, even to more advantage than with a right of common, which can hardly be doubted, as he is enabled to provide winter as well as summer food, there is an end to that obstacle to improvement. Indeed, if sufficient attention be paid to the principles above detailed, the situation of the cottager, instead of being deteriorated, would be materially bettered by the inclosure; and his rising family would be early accustomed to habits of industry, instead of idleness and vice.

I shall conclude with asking, if any one can figure to himself a more delightful spectacle, than to see an industrious cottager, his busy wife, and healthy family, living in a comfortable house, rented by himself, cultivating their little territory with their own hands, and enjoying the profits arising from their own labour and industry? or whether it is possible for a generous landholder to employ his property with more satisfaction, or in a manner more likely to promote, not only his own, but the public interest, than by endeavouring to increase the number of such cottagers, and encouraging, by every means in his power, the exertions of so meritorious, and so important a class of the community?

Plan of the proposed Cottage Farm, pointing out the Rotation of Crops in the different Lots.

Cottage.	The Orchard, or perpetual Pasture.	Pond.

Lot A. 3 Roods. 1 Year { 2 Roods Potatoes. 1 Rood Turnips.	Lot B. 3 Roods. 1 Year { 2 Roods Winter Tares. 1 Rood Spring Tares.
Lot C. 3 Roods. 1 Year—Barley, Wheat, or Oats.	Lot D. 3 Roods. 1 Year—Clover and Rye-grass.

The Rotation of Crops for Four Years.

Year.	Lot A.	Lot B.	Lot C.	Lot D.
1	Potatoes and Turnips.	Winter and Spring Tares.	Barley, Wheat, or Oats.	Clover and Rye-grass.
2	Winter and Spring Tares.	Barley, Wheat, or Oats.	Clover and Rye-grass.	Potatoes and Turnips.
3	Barley, Wheat, or Oats.	Clover and Rye-grass.	Potatoes and Turnips.	Winter and Spring Tares.
4	Clover and Rye-grafs.	Potatoes and Turnips.	Winter and Spring Tares.	Barley, Wheat, or Oats.

The rotation then begins as at first. Lot D might continue in natural grass the first season, to diminish the labour of that year.

The exact period when the different crops should be dug for, or sown, cannot be ascertained, because it varies so much in different counties; and depends upon the seasons; but, according to the above rotation, the labour of digging for the various crops is diversified as much as possible, so as not to interfere materially with the other occupations of the cottager. At no period would it be necessary for him to dig more than two roods in a month; and both he and his family will labour with much more satisfaction and dispatch when they work for themselves than for another. In case of necessity, the cottager might hire some of his neighbours to assist him in digging, which would be much better than hiring a plough. If it is found that a cottager, under this system, cannot work as a common daily labourer, it might at least answer for labourers by the piece, who are so extremely useful in all countries.

 On

On the successful Introduction of new Articles into Field Culture. *By* Joseph Wimpey, *Esq.*

From Hunter's Geogical Essays.

If in the idea of new articles be included those which have been transferred from the garden to the field, the number will be far from being inconsiderable. Turnips, potatoes, cabbage of different kinds, carrots, parsnips, &c. were cultivated for domestic uses, long before the time proposed; but the field culture of these articles for the feed of cattle, in any considerable degree, is quite a modern practice. The success which has attended the use of these articles, hath incontestibly established their great value and importance; but unfortunately their culture hath been hitherto much confined, and is very far from being generally practised.

Many kinds of grasses have likewise been strongly recommended as valuable improvements, which, having answered the sinister views of some of the recommenders, in selling their seeds at a great price, and upon trial being found greatly inferior to the spontaneous growths of this country, have very deservedly fallen into general disuse, and are no more thought of. There are two articles, however, commonly reckoned among the grasses, which must ever be distinguished and separated from those that have been found useless, that is to say, Sainfoin and Lucerne; these merit more attention and care than have been usually bestowed upon them, and would well repay the farmer for all his expense and trouble, if bestowed with discretion and judgement, for they certainly might be made improvements of the most valuable kind.

Sainfoin has been sown pretty extensively in some parts, but not so generally by far as it deserves. It generally succeeds well upon chalk, from whence it has been very erroneously concluded, that it will not thrive in a deep soil. It is supposed a hard substratum of chalk prevents the deep penetration of the roots, which is the natural bias of the plant, for it is not known to what depth it would descend in a friable soil that would yield to the perpendicular descent of its root. From hence it is strangely concluded, that the plant in such soil is exhausted of its vigour by the luxuriance of its own roots; and that the produce of the herbage on the surface is small in proportion as that of the roots is large. This notion, repugnant as it certainly is to common sense and reason, as well as to experience and observation, is firmly believed and maintained by men of very good abilities; so invincible are prejudices early imbibed, and supported by local customs, and habits of practice long established.

I am clearly of opinion, that there are few arable farms in the kingdom which are not capable of great improvement by planting of sainfoin, more especially those which are but poorly provided with good pasture and meadow land. The poorest fields of such farms might, by proper management, be brought to produce good crops of sainfoin; and land, the natural intrinsic value of which is not more than from 2*s.* 6*d.* to 5*s.* an acre *per annum*, might certainly, at a very moderate expense, be made worth from 20*s.* to 40*s.* This would prove an unspeakable advantage to the occupier as well as to the owner of a farm that is almost wholly arable, as it would enable him to keep a much larger number of milch-cows, and hogs in proportion, and by these means greatly increase the quantity of manure for the improvement of his corn-fields.

The

The greatest enemies sainfoin has to encounter, are grass and weeds: these in land that is tolerably good, soon overcome and destroy it, unless the farmer will take the trouble, and be at the expense of keeping it clean. But this is by no means so formidable an undertaking as hath been generally thought, provided the land be very well cleaned and pulverized before the seed be sown, and provided also it be sown in rows from fifteen to eighteen inches distant, which is as near as it ought to be sown, if intended for a lasting plantation. At those distances, the intervals between the rows may be kept perfectly clean with a small plough and a narrow drag of about twelve inches wide. With these instruments several acres may be cleaned in a day, and supposing this to be done three times in a summer, the expense would amount but to a trifle. My drag is twelve inches wide, and proves extremely useful in drilled crops of every kind, as also in those of what nature soever that are planted in rows.

Lucerne, under a similar management, would be a very great improvement on arable farms. Indeed an opinion generally prevails, that it requires a much better soil than is commonly found. Crops of all kinds are more abundant on a good than on a bad soil, if they are kept clean; but it is a very erroneous opinion, that lucerne will thrive only on rich land. It may be raised to great advantage on land of a very indifferent quality, by the same means as above recommended for sainfoin, and the same care to keep it free from grass and weeds. I have cut five good crops off such land in one summer, after having been planted five years, without a grain of manure of any kind, except a small sprinkling of turf ashes the second year after sowing the seed. A few acres of either, or both these grasses, with a few more of potatoes, cabbage, or turnips, would enable the occupier of an arable

farm

farm to keep from eight to twelve, or even twenty milch-cows, according to the size of his farm, though he should not have an acre of meadow or pasture belonging to the same.

Of articles which are truly useful and entirely new, we know of few that have been introduced within the time mentioned. The turnip-rooted cabbage is a truly valuable root, which was accidentally discovered about twenty years ago, and has been cultivated with great success by several gentlemen, and strongly recommended by them to the attention of the farmer. Both its roots and greens are exceeding good food for cattle, but what constitutes its principal excellence is its extreme hardness, for it resists the violence of the most vigorous seasons and severest frosts. When the common turnip and hardiest cabbage have been entirely cut off and destroyed, this has continued its fine verdure, and supplied the kitchen with greens, and the cattle with sweet and wholesome roots, even till the middle of May.

Another new article, which has been very lately introduced, is the *Mangel Wurzel*, or Scarcity Plant. From the success some few gentlemen have had in its cultivation, it seems to promise to be of the greatest utility for the feed of cattle. However, it is very little known as yet, it being supposed that not one farmer of a thousand has so much as ever heard of the name. It is generally agreed to be a species of the beet, of which there are many. The seeds of both have exactly the same appearance, and the leaves and roots differ only in colour and size, for the manner of their growth is exactly the same; but the leafage of the new sort is said to be much more luxuriant and abundant, and the roots vastly larger.

In order to discover the most advantageous mode of raising this plant, I sowed, or rather set, a quantity of the seed in several different ways in April last. The beginning of July, the outside leaves had obtained their full growth, some of which I broke off and offered to the horses and cows, who eat them very freely; but when offered to the pigs, they seized them with great eagerness, and devoured rather that eat them. The pigs are still fed with them daily, and constantly prefer them to every kind of green food or root that can be given them. Breaking off the leaves takes up much time, and is very troublesome; therefore when the outside leaves are fully come to maturity, I cut the whole clean off, about an inch and a half above the ground, whence fresh leaves shoot up very freely. My experience is yet too small to speak with confidence; but, it seems to me, an acre of this plant, if it takes well, would be sufficient to keep twenty pigs very well for five or six months, say from July to November, or December, inclusive.

The improvements made for cultivating turnips for the feed of sheep and fattening of cattle, is so generally known, and extensively practised, that it seems unnecessary to say any thing on that head. I will, however, beg leave to observe here, that the opinion generally maintained, that turnips are an improper food for milch-cows, as it spoils the cream and butter by impregnating the milk with the strong flavour of the turnip, appears to me, by repeated experiments, to be ill-founded. The two last winters and springs my milch-cows lived chiefly on turnips, and their butter was found not only as good as my neighbours, whose cows ate none, but was even preferred to it. They say their opinion is grounded on experience as well as mine. The difficulty, I apprehend, lies here: my turnips are pulled, brought home, and given

given to the cows in the yard; their cows have been used to be turned in upon them, where they pick up the charlock and other weeds which abound among them, for they are never hoed; and to this, and not the turnips, I am persuaded, the disagreeable flavour of the milk is owing. It must be observed that the turnips should be given to the cows while they are fresh and firm, for all food when grown putrid and corrupted is unwholesome, and doubtless would affect the juices of the animals that eat it.

Of all the articles we have mentioned, or that are yet known, perhaps very few can equal, and none excel the *Potatoe.* The inestimable value of this root is hardly to be conceived. It is not only an almost constant dish in great and opulent families, but in times of scarcity and dearness, the poor are almost wholly subsisted by it. There are many poor families in this neighbourhood, who, the last winter, ate them three times a day with a little salt, without a morsel of meat or bread with them. It is true they have been long in use for the food of man, but it is of late date that they have been extensively cultivated for the feed of cattle; and even now I am pretty clearly of opinion, that if they were much more generally cultivated than they have hitherto been, the farmer would find his account in it, especially where a substitute is much wanted in the winter and spring seasons for the support of his cattle.

Hogs are immoderately fond of potatoes, and will live entirely upon them till they are fit to put up to fatten for pork or bacon; and then, boiled and mixed with barley or pease meal, they fatten on them speedily and make fine meat. Another use I have put them to, which has been little practised, or thought of; that is, for the feed of milch-cows. Three gallons a day, half at night, and half in the morning, is quite sufficient to keep a large cow in

full milk, and the milk as sweet and as good as in the summer months. Nothing excels them for the feed of cows which are fatting their calves for the butcher. I fatted four last spring, which were sold from 35*s*. to above 40*s*. a calf, which was double what I ever sold any for at this place before. Last year, after taking them up, several calves, about six or seven months old, were turned into the potatoe ground with the cows; they fed upon them as kindly as so many pigs, and preferred them to every thing else they could meet with.

I have had no experience of their use as food for horses; but I have been assured by a gentleman who resided some years in Ireland, that he kept his hunter, a stone horse, entirely upon them instead of corn. He ate nothing else, excepting hay between his feed of potatoes, as other horses; yet he was as fat, as healthy, and nearly as strong, and as full of spirits, as if he had given him all the corn he could eat.

Discovery of a particular Principle in Sandarac; and Method of preparing a good Varnish from that Substance.

By M. GIESE, *of Augsburg.*

From the JOURNAL DE CHIMIE.

IT has been long observed that, in making varnish of sandarac with spirit of wine, a considerable quantity of matter is deposited in the varnish, and could not by any means be dissolved. It is this matter which the author proposed to examine.

On a certain quantity of residue of sandarac, M. Giese poured highly rectified spirit of wine, and exposed the mixture

mixture to a steady heat for several days. At the end of that time no perceptible solution had taken place, whence he concluded that the matter was insoluble in alkohol. He therefore submitted it to the following experiments.

A select portion of sandarac, finely pulverized, was dissolved warm in 16 parts of highly rectified spirit of wine. After three days the solution was still far from complete, notwithstanding the great proportion of spirit that had been employed.

The solution was poured off from the sediment, four parts of spirit of wine were again poured to the latter and digested warm, for two hours; but not the least diminution was observed in the quantity of the residue. The mixture was filtered and the concrete matter dried. It weighed about a fifth part of the sandarac employed for the experiment, had a light grey appearance, was very brittle, and easily pulverised. The author submitted it to the following experiments.

Experiment I. When brought near the flame of a candle the matter instantly took fire, and burned with a bright blaze, emitting a thick smoke. The residue was a black shining matter, resembling resin.

A small quantity of this residue, when exposed with alkohol to a violent heat, was dissolved; the solution became white with the addition of water.

Experiment II. Water boiled with the residue could not dissolve the smallest portion of it.

Experiment III. On the residue was poured ether by sulphuric acid. It was quickly and completely dissolved by it. This solution possessed the following properties:

1. It deposited on bodies that were covered with it a white sediment similar to lime.

2. When poured into alkohol the dissolved matter was precipitated.

 3. But

3. But when poured into water it was not precipitated, and only after the volatilization of the ether it was observed that the water was covered with a white shining pellicle, of a resinous appearance.

Experiment IV. On the residue was poured concentrated sulphuric acid. It first assumed a red colour, and by degrees it dissolved in the acid with which it formed a thick liquid, of a reddish-brown colour.

1. A part of this solution was poured into water; a quantity of whitish flakes was instantly separated, and collected on a filtre.

2. These flakes being treated with alkohol were almost entirely dissolved in it, and again separated from it by the addition of water.

Experiment V. Nitric acid poured on the residue was incapable of dissolving it cold; and it was only after a certain time, and with the aid of heat, that this acid dissolved a small portion of it.

From these experiments it results that the substance remaining from the solution of sandarac in alkohol is a principle differing from resins, and that sandarac is a composition of that substance and resinous matter. This residue has hitherto been thrown aside as useless by the makers of varnish; as it burns readily, and emits a smell by no means disagreeable, the author proposes to introduce it as an ingredient in the composition of perfumes for fumigation.

M. Giese concludes with a few directions relative to the making of a good varnish with sandarac.

1. The proportions should be two parts of alkohol to one of sandarac.

2. The sandarac must not be pulverised.

3. The solution should be made cold, and should be promoted by frequent agitation.

By

By observing these rules, the varnish, when applied, is almost always prevented from becoming of an opaque white in drying; which is occasioned by a portion of the fresh substance, which, when the sandarac is pulverised, is held in solution by means of heat and the aid of resin.

On oleaginous Hydrogen. By Professor PROUST.

From the JOURNAL DE PHYSIQUE.

THE memoir of the Dutch chemists suggested to me the idea of making a few experiments on the gas obtained by distillation from olive oil. If the consequences which I have ventured to draw from them be not perfectly correct, they will at least contribute to extend the knowledge of this new order of facts, and to multiply the means of studying them better.

I call this gas oleaginous, because I conceive that its great weight, its white, dull, smoaky flame, its strong smell, and in particular the property of becoming lighter by passing several times through alkohol, prove a simple solution of oleaginous vapor in carbonic hydrogen.

Even the purest oil invariably gives carbonic acid with oleaginous gas. Berthollet very justly observes, that a certain proportion of oxygen must be allowed to exist in oils, which is likewise confirmed by their continual absorption of it. Perhaps some may be inclined to class this acid among the principles of the mucilaginous substance, which Scheele separated from it by means of oxyd of lead; but if on the one hand the nature of the ingredients of the operation be considered, and on the other that of the sugar

sugar of oils, I think it will not be at all unreasonable to suppose that this sugar is entirely formed by the oxyd during the boiling.

It is free from every metallic substance, for it does not disturb hydro-sulphurated water; but there is a marked distinction between it and the other vegetable sugars, as it is incapable of fermenting, corrupting, or becoming mouldy. I have kept three or four ounces of it above ten years; it is of the consistence of a very clear syrup, and the hottest weather has never made the slightest alteration in it. In short, I am strongly inclined to believe that this sugar is rather a new product than a substance separated from oils.

Distilled oil exhibits characters to which little attention has been given. It is converted into volatile, odorous or essential oil, by doubtless dissolving a certain quantity of carbonic hydrogen. The following are some of its properties.

When heated with water in a retort, a portion passes over in distillation. It has a very strong but disagreeable smell, and is so light as to belong to the class of volatile oils, since its weight to that of olive oil is only as 91 to 100. It floats on alkohol which easily disolves it. It boils as soon as essence of turpentine, and if a lighted taper be held to the mouth of the matrass, the vapor takes fire like that of the substance just mentioned.

I have not strictly examined the liquid acid which accompanies distilled oil: I shall only introduce here a fact relative to its history. If soap be distilled till the oil is destroyed, the saline residue, which I imagined would be carbonate, is sebate of pot-ash. It is crystallisable, and sulphuric acid instantly produces with it that subtile vapor, denominated sebacic acid. It is converted into the oleaginous hydrogen, which hold in solution the artificial essential

essential oil, of which I spoke in the beginning. But the heat suddenly siezing the portion of the oil it contains, it passes from the gaseous state to that of carbonated hydrogen, in the same manner as ether, alkohol, radical vinegar, essence of turpentine, &c.

I shall conclude this subject with an experiment made by Rouelle in his lectures, and which I likewise exhibit in mine, because, besides being an agreeable spectacle, the explanation of its causes is closely connected with the theory of inflammations.

Pour half a spoonful of olive oil into a small brass crucible heated to a faint red, or to a certain degree which the operator must previously endeavour to ascertain. A large column of white smoke instantly rises from it which takes fire at the top, that is, at the distance of four or five feet from the crucible. If on the contrary, it takes fire below near the crucible, the latter is too hot. It is necessary to wait a few moments, and the phenomenon is exhibited in all its magnificence. Wax produces the same effect, but I think there is less certainty with it than with oil.

On the Disoxydation of Iron.

The most simple truths of chemistry are not always the most easily explained in public instruction. For instance, nothing is more evident to the most numerous auditory, than the surcharge of oxygen which iron carries along with it in the experiment of the canon, because there is not a spectator who cannot ascertain it with his own eyes, and perfectly convince himself of what is intended to be shewn him. But when, in the connection of ideas and proofs you arrive at those which relate to the disoxydation of the above metal, you must give up facts, and substitute suppositions, because the former are

not

not capable of being easily executed in public. In very few instances indeed can a degree of heat be applied to the oxyd of iron sufficient to disoxydate it, and not even to reduce it easily by fusion. But this difficulty may be partly surmounted in the following manner.

Heat for the space of an hour a mixture of an ounce of load-stone, and two penny-weights of charcoal, in a small luted glass retort, the luting of which projects two inches from the bottom. It is placed immediately on the grate of the furnace, and its neck projects from it through the door of the fire-place, closed with pieces of brick and earth, which keep the retort in its place. If the neck is not long enough to reach into the pneumatic vessel, which for this purpose should be a bowl or soup-dish, with a plate of lead, perforated with holes, another must be fastened to it, and luted with paper and paste.

This done, cover the grate and the retort with charcoal, with the usual precautions. By this disposition it is subjected to a much more violent heat than if it were placed on the bars. Carbonic acid and carbonic oxyd may then be obtained with the greatest facility.

When the retort is cold, it is found nearly filled with a spunge of pure iron, which assumes metallic lustre if rubbed with a polished substance. This spunge is torn with difficulty: it is plain that there is a connection of all its parts, notwithstanding their distance from each other. It takes fire with the blow-pipe, and emits sparks. The load-stone lifts it up entire. It may be used for producing hydrogen with sulphuric acid, and indeed every one must be convinced upon touching it that it is iron restored to its original state. As in this operation carburet is formed, the solution of iron has the bituminous smell, which characterises that of brass.

If,

If, instead of charcoal of blood, well washed, be added to the oxyd of charcoal, ammoniacal carbonate is deposited in the neck of the retort. I have explained the origin of this production in my second memoir on Prussian blue. The solution of iron then with potash yields phosphate at the first moment of its precipitation. The bituminous smell of solutions of brass, and likewise gas, may be obtained from fresh charcoal of blood; if treated with sulphuric acid, it takes fire at the mouth of the matrass. The reason is so evident, that it would be superfluous to give any account of it.

Four inches of this gas and one of oxygen do not take fire in the canon with the charge of a pocket electrophorus; neither is this effect produced with two, nor even three of oxygen. My object in these experiments was to see whether charcoal or oil would be precipitated. But with four inches of oxygen, or equal parts, inflammation takes place; and an agreeable surprise is produced when upon turning the cock the gaseous residue, instead of being diminished, is found on the contrary increased to thirteen or fourteen inches. This sudden dilatation is attended with another fact not less curious, the explanation of which instantly occurs to every one who recollects Monge's observation on an atmosphere more or less compressed. A cloud or thick fog fills the canon in proportion as this residue escapes from the compression in which it was before retained. Let us now examine the eight inches of mixture augmented in bulk to thirteen or fourteen by inflammation.

It is poured through lime-water to purify it; and it is observed scarcely to disturb it, and sometimes not at all. It likewise keeps up its dimensions to thirteen or fourteen inches within a few lines.

If a light be held to it, you discover that it is no longer oleaginous hydrogen. Its blue flame descends slowly,

and it is consumed wit[illegible] the least detonation. It has, besides, but very little smell, extremely different from that of oleaginous hydrogen.

This gas burned with oxygen is wholly converted into carbonic acid, and no longer affords the phenomenon of dilatation, however small may be the quantity of oxygen that is mixed with it.

The following are the conclusions that I have ventured to draw from these results.

I think this residue cannot retain the smallest portion of oxygen after inflammation, otherwise it would burn rapidly, whereas the contrary takes place.

Four inches of oxygen usually consume seven inches and a half of pure hydrogen in my eudiometer; and as the remaining gas in the experiment contained a very small quantity of carbonic acid, the four inches must have consumed at least seven of hydrogen, if it was in the usual state of dilatation in which it is kept by the pressure of the atmosphere.

Four inches of oleaginous hydrogen would therefore, according to this calculation, contain seven inches of pure condensed hydrogen in the space of four. Besides, our residue, after the combustion of four inches of oleaginous gas, is suddenly changed into 13 or 14 inches of carbonic hydrogen. It must hence be concluded that our seven inches of hydrogen, compressed into the space of four, held in solution a quantity of oil capable of being transformed, by the assistance of a powerful heat, into 13 or 14 inches of carbonic hydrogen. I say a powerful heat, because, in fact, that alone can convert oil into carbonic hydrogen.

Hence I conclude, that when four parts of oleaginous gas are inflamed with the same quantity of oxygen, nothing is actually burned but hydrogen.

Essay

Essay on the Fecula of Green Plants.

By Professor Proust.

From the Journal de Physique.

Hilaire Rouelle was the first that discovered in the fecula of plants a substance analogous to the gluten of flower. Since his time the existence of the latter has not appeared doubtful, because there are few chemists who have not themselves ascertained its real characteristics; but the fecula, the basis of which it forms, is, in the opinion of Fourcroy, only an imaginary substance; or at least too superficially observed to be reckoned amongst the immediate products of vegetables. He even goes so far as to suppose that the albumen, an animal production, which nobody before him suspected to be in plants, is the substance intended as a substitute for the glutinous part of the green fecula.

Are the albumen and gluten contained in a combined or separate state in the juice of plants? Such was the question I proposed to myself, and which I shall endeavour to resolve in this sequel to my observations on *the System of Chemical Knowledge.*

To spare the reader the trouble of referring to the work, I shall transcribe the passage in which the author collects the facts, and the arguments from which he drew his conclusions. This passage is the more remarkable, for the contradiction between his manner of characterising other vegetable productions, and that of the chemists of the day.

"Rouelle, junior, who had particularly examined and compared it with animal matters, asserted, that he had found it in coloured feculæ; and especially in that called

the green fecula of plants. But the term fecula, given indiscriminately to the fibrous matter contained in the juice of plants, and to the starch, having led chemists to consider the latter as part of the residue of solid vegetable substances, there is reason to believe that it was only from analogy, and on account of some equivocal properties, that Rouelle imagined the green matter contained gluten; at least the experiments which have been made since that time, and those which I have frequently repeated on coloured feculæ, furnished no confirmation of this assertion; and no actual proof has been adduced that gluten is one of the principles of the latter fecula."

The term fecula, says Fourcroy, given *indiscriminately* to the fibrous matter contained in the juice of plants and to the starch, having caused the latter to be considered as the residue of solid vegetable substances, &c.

I shall first remark that this opinion is not correct. The chemists of the present day will certainly not agree with M. Fourcroy, that the confusion occasioned by the improper use of words, of which modern chemists have so justly complained, produced any inaccuracy in the ideas of our predecessors. Our instructors called things by improper names, it must be admitted, but they confounded them no more than we.

Even at the time when every vegetable deposit was considered a fecula, they never were so far misled by the resemblance of the names as to assimilate starch to the residue of the solid parts of plants. In the first place, we know of no residue to which the chemists could reasonably have compared it: and, secondly, if any of them had taken the green fecula for a residue, yet there was not one who was not perfectly aware of the difference between this fecula or residue, and starch; and since no such confusion appears in their works, it is unjust to reproach

proach them with it; for it [illegible] be sufficient to look into those of Rouelle, Macquer, Baumé, Sage, Parmentier, &c. to be convinced that the word fecula never led those authors into assimilations so contradictory to their judgment, as that of ranking under one head green fecula, the residue of solid particles and starchy substances.

We shall now pass to the green fecula, and will venture to assert, that in the laboratories, in pharmacy, and still less by a chemist so celebrated as Rouelle for accuracy of investigation, the broken stalks of green plants were never confounded with the beautiful soft liquid expressed from their leaves, with that emulsive product, which, whilst fresh may be strained through a cloth, and which by its excessive fineness and the brilliancy of its colour, so far surpasses herbaceous filaments.

Besides, if the fecula were a substance homogeneous with the rest of the plant, if it were only a portion that differed from the remainder merely in being more bruised, would not trituration be sufficient to convert that remainder into fecula? When the pestle bruises a fresh herb, it destroys its texture, but does not pulverise it.

This contusion is, in some instances, so perfectly different from a dry pulverisation, that its fecula can by no means be compared with a humid powder. If you crush an aqueous juicy plant, for instance a *sedum*, with a roller, on marble, the juice expressed will afford fecula. It is not to trituration that a fecula owes its silky softness, the impalpability which distinguishes it from powder; it is in its nature molecular, and may even be crystallized in the fibrous interstices in which it is deposited by vegetation.

Rouelle asserts, says Fourcroy, that feculæ contain a principle similar to animal matters, &c. Rouelle went farther:

further: not satisfied w[illegible]le assertions, he proved it not by analogy or equivocal properties, but by a series of convincing facts, by results which combined the principal characteristics then known, and even still known, to exist in animal substances. Whence could Rouelle otherwise have drawn his analogy, to compare as he did green fecula to the gluten of wheat? What have those two products in common in their appearance, that can lead to comparisons between them? To discover points of resemblance, it was necessary to examine their composition, their chemical properties, and that was what this laborious chemist actually did. It was the approximations deduced from analysis that served as the basis of the memoir he presented on green fecula, and of which no mention is made in the *System of Chemical Knowledge*; doubtless, because its illustrious author, convinced in his own mind that Rouelle confounded albumen with gluten, conceived that an account of his mistake was of no importance to the history of chemistry.

Rouelle however found in the fecula of sorrel a product, possessing in such a powerful degree the chemical properties of albumen, that he used it as a powerful argument, for calling the attention of his age to a substance so nearly resembling an animal production. As he afterwards extracted it from a plant, which according to Foucroy furnishes not the least vestige of albumen, it cannot now be denied any more than it could then, that Rouelle first discovered in juices and green feculæ a product, which if it cannot be called albumen, yet so perfectly possesses all the properties that have exclusively called the attention of chemists to the latter, that it appears equally entitled with albumen itself to distinction in the history of their discoveries.

To

To the same penetration and the impulse of that genius which led to these discoveries, he was indebted for that of the astonishing similarity between caseum and gluten, after they have both undergone the kind of fermentation which transforms them into that cellular, odorous and savory composition called cheese? In this extraordinary result, gluten more nearly resembles the other the more carefully it has been washed. Macquer, who ascribes part of these changes to a residue of starch, had not an accurate idea of the subject; starch, a substance always inactive in fermentation, either of bread or beer, and even in germination, would only tend to retard that of gluten, and consequently could only partially destroy those characters whence Rouelle deduced the analogy of those two products.

And even their analysis far exceeds the limits assigned them: for when gluten has exchanged its state as an insipid and viscous mucilage for the cheesy state; when it has passed through all those degrees of fermentation necessary for arriving at that state, it is found equally impregnated with those sharp and burning salts which constitute the principal recommendation of Roquefort cheese; salts which have no connection with what is added, and which are found equally powerful in the curd after being washed, and left to ferment of itself.

In the cheese of gluten, in fact, as in that of animals, pot-ash and sulphuric acid lead us to recognize the ammoniac and vinegar which Vauquelin discovered. Can then ammoniacal acetate be one of the seasoning ingredients of cheese? I only know that alkohol applied to the strongest cheese deprives it of all taste. An analysis undertaken on that principle might furnish curious results; but let us return to green feculæ; let us examine them by the lights

lights of modern chemistry, and let us in particular endeavour to discover whether albumen actually exists where Beccari and Rouelle discovered gluten.

Green Fecula.

I. Heat produces a change in fecula capable alone of giving it a decisive character as to its nature. I allude to that concrescibility of which there are few examples among vegetable products; to that agglutination which attaches its particles to each other, and gives it the appearance of a cheesy curd. Although fecula, before this change, may be easily strained through a cloth, it cannot after being heated; a particular kind of crispation has deprived it of its tenuity; but heat does not coagulate the fibrous texture; in this respect the fecula has not the least resemblance to the broken stalks of green plants.

II. The fecula separated from the juices by filtration, acquires in drying an elastic and horny consistence. It is softened with difficulty in hot water; but it does not become perfectly soft even in a month; notwithstanding the moisture, it preserves its horny quality. If bent, it returns to its position, but absolutely refuses to crumble: these are qualities scarcely remarked at all in the dried woody pulp.

The feculæ of green and white cabbages, of cresses, of hemlock, &c. do not, however, lose their property of coagulating by heat. If into water heated to between 50 and 60 degrees, you plunge two corresponding matrasses, one with diluted fecula, and the other with the water and white of egg, the fecula hardens and coagulates in flakes, such as are seen in a juice set upon the fire to clarify; but at that temperature the albumen does not even lose its transparency.

III. The

III. The green fecula is nearly of the same weight as water, for that of plants, which are not acid, often requires more than eight days to settle.

Into three glasses, of equal dimensions, put fecula, washed and diluted. To the first add a small quantity of alkohol, a few drops of acid to the second, and place the third between the other two, for the purpose of comparison. The two first are completely precipitated in less than half an hour, whilst the precipitation of the third is scarcely begun; thus alkohol and acids are capable of coagulating the fecula, but have not the same effect on the woody residue.

IV. One hundred parts of the dried fecula of hemlock, yield to alkohol 15 or 16 of green resin. When taken out of the repeated infusions to which it must be subjected, it remains of an earthy grey colour, and alkohol is incapable of bleaching it. Sage, who was perfectly acquainted with feculæ, found that some yielded one-third of their weight in resin; to separate it, they must be thrown, moistened, into spirit of wine, which penetrates and attacks them on all sides; but this is effected with much greater difficulty when they have been rendered horny by desiccation.

TO BE CONCLUDED IN OUR NEXT.

Method of preparing muriatic Ether with simple Acid.

By M. Basse, *Apothecary at Hameln.*

From Scherer's Journal der Chemie.

MELT marine salt in a crucible, and keep it in fusion an hour, or till the whole of the water of crystallization be dissipated. Put twenty ounces of this salt into a tubulated retort, adapt to it a curved tube, and plunge

the tube to the bottom of a bottle with two necks, into which have been poured ten ounces of alkohol, marking 100 on Richter's alkoholimeter. (This alkohol must be prepared, by mixing in a retort three parts of highly rectified spirit of wine with one part of pot-ash, melted and pulverized, whilst hot, and it is distilled till diminished one half.) When the whole is well luted, pour into the retort, in quantities of half a penny weight at a time, ten ounces of highly concentrated sulphuric acid. After each introduction of acid close the tube carefully, and put in no more fresh acid, till the salt has quite ceased bubbling. The cork of the other neck of the bottle must be taken out from time to time, to suffer the air condensed above the alkohol to escape.

After all the acid is introduced, place the retort on a sand bath, and heat it gradually till all the muriatic acid be expelled. During this part of the operation care must be taken frequently to cool the bottle containing the alkohol by wrapping a wet cloth round it.

The alkohol thus charged with acid, is then put into a retort and distilled to one half. Shake the distilled liquid with a sufficient quantity of alkaline ley to carry off the acid, decant the supernatant portion which is ether, and keep it in bottles well corked. From the above-mentioned quantities, two ounces and a half of ether are usually obtained.

M. Basse asserts that by operating with thermoxydated muriatic acid, light alkoholic ether can never be obtained, but only a heavy oleaginous ether which instead of floating on water falls to the bottom of that liquid.

Transactions of Societies for promoting useful Knowledge.

Paris.

Philomathic Society.

M. TOURDES, Professor of the School of Medicine at Strasburg, last year announced that the fibre of blood, separated from the lymph and aqueous humour, nearly pure, coagulated, and still retaining a heat equal to 30 degrees of Reaumur, exhibited, when submitted to the action of the Galvanic pile, an actual contraction, perceptible with a magnifying glass.

This observation, extremely important for the study of physiology, was calculated to excite the attention of persons interested in that science; yet it remained in a kind of oblivion till M. Circaud, a student of medicine at the School of Paris, made the same remark without knowing that it had been already announced. He therefore bestowed the utmost attention on his experiments, and exhibited before several naturalists, and physiologists, the discovery which he imagined he had made.

Some of the members of this Society have actually witnessed this manifest contraction of the fibre, obtained from the blood of an ox killed a few minutes before. The contraction of the coagulated mass was visible to the naked eye; and the movement was perfectly similar to that observed in the muscular fibres.

The pile was composed of 60 disks of zinc, as many of copper and pieces of cloth, impregnated with a solution of muriate of soda. The fibre was at the heat of about 32 or 33 degrees of the centigrade thermometer. The contraction lasted about 60 seconds, after which it entirely

entirely ceased. This experiment did not succeed the two first times that it was tried.

Mr. Mushett some time since announced that iron, submitted to the action of heat, in a close crucible, was converted into steel, and melted; and that it might then be poured off. He attributed this alteration to a combination of carbon, proceeding either from carbonic acid decomposed by iron at that powerful degree of heat, or from charcoal reduced to gas, and introduced into the inside of the crucible.—M. Collet Descotils, in order to satisfy the doubts that might be entertained of the above circumstance, so contrary to M. Clouet's experiments on the conversion of iron into steel by calcareous carbonate, and M. Guyton's on the same, by means of diamond, determined to repeat Mr. Mushett's experiments.

Three experiments, made with every possible precaution to separate the iron from every substance of the nature of charcoal, convinced M. Collet Descotils that whenever that was the case, the nature of the iron was not changed, and that when steel was formed it was only by accident. He likewise observed, that iron is by no means so difficult to be melted as has hitherto been imagined, having found that it ran in a very short time in all his experiments.

Society of Arts and Sciences at Utrecht.

This Society has proposed the following prize-question for the year 1803.—What is the true nature of electric matter? Is it a compound? What are the chemical changes that it undergoes when united with other bodies, and those which it produces in those bodies.

The prize, which is to be adjudged on October 1, 1803, consists of 30 ducats; and memoirs are to be addressed to Dr. Luckman at Utrecht.

Dublin Society.

Premiums were lately adjudged, by the Dublin Society, to Mr. John Templeton, of Belfast, and Dr. Scott, of Dublin, for the discovery of native Irish plants, not hitherto described in any botanical work. To the former gentleman a premium was awarded for the discovery of a new species of rose, found in different parts of the counties of Down and Derry; and to the latter, for the discovery of two species of mosses growing on rocks in the vicinity of Balbrigan, county of Dublin; the first so near the sea as to be covered by it at high tides, the other growing among the mountains southward of Swadlinbar, on the banks of a rivulet, the soil of which was formed from decayed argillaceous schistus; and likewise for his discovery of a vegetable substance found growing in detached lime-stones in the bed of a rivulet in Queen's county.

The Museum of this Society, in addition to the collection more immediately connected with the great national objects of that body, is daily augmenting by the contributions of its members and others, so as already to present a collection of natural and artificial curiosities, highly interesting to the mineralogist, naturalist, and antiquary. Some very curious additions were lately made to it by Sir Walter Synnot and the Honourable Captain Stratford; the former having presented the Society with some Etruscan vases, several Roman lamps, sacrificial vessels, coins, &c.; together with several rare curiosities in South Sea Cloth, and natural history. An Anas Egyptiaca, or Egyptian goose, in high preservation, has been acknowledged from the latter gentleman.

Intelligence relating to Arts, Manufactures, &c.

Tanning.

MR. Davy, Professor of Chemistry in the Royal Institution of Great Britain, in a paper lately read to the Royal Society, has described the processes usual in the art of tanning, entered at large into a chemical investigation of the nature of the agents employed in the process, and detailed a number of ingenious experiments, undertaken expressly for the purpose of ascertaining the mode of their operation.

Agriculture.

A course of lectures, explaining the application of the principles of chemistry to the various operations of agriculture, has been prepared by Mr. Davy; and the introductory lecture has been read before the board, at their house in Sackville-street.

Destruction of Bugs.

Numerous methods have been employed, and many of them with very little or no effect, for the destruction of those troublesome insects—bugs. M. Gatte, an apothecary of Como, has discovered a mixture, which is recommended in preference to every other, as capable of destroying not only the insect itself, but also the nits. This composition is tincture of cantharides, prepared with an ounce of good alkohol and two penny-weights of cantharides. An infusion is made of these two substances cold, at least twenty-four hours, and in a glass vessel, well closed, and shaken from time to time. This tincture must not be filtered, and must be shaken when used, that the sediment may be mixed with the liquor. It is sufficient to dip a brush in it, and to rub the places to which the insects retire.

Stereotype Printing.

Earl Stanhope has lately been much employed in bringing to perfection an improved mode of printing. His invention, though in some respects similar to the French stereotype, is said to be very superior to it, with regard to neatness, accuracy, and cheapness.

Aërostation.

It is said that the art of guiding air-balloons has been lately discovered at Berne, in Switzerland; and that an experiment had been made of it near Seedorf, which is shortly to be repeated in England, the secret of the discovery having been purchased by a native of this country.

Patent Lamps.

Messrs. Smethurst and Paul, who have just obtained the King's Patent for lamps and reflectors made on a new principle, have lately made an experiment of their invention in New Bond-street. From the increased quantity of light which they afford, and the more equal manner in which it is distributed, this invention promises to be of great public utility.

List of Patents for Inventions, &c.

(Continued from Vol. II. Page 472.)

William Bainbridge, of Little Queen-street, Lincoln's-Inn-Fields, Middlesex, Musician; for improvements on the flagelet or English flute.
Dated April 1, 1803.

William Boond, of Manchester, Lancashire, Cotton-manufacturer; for a new-invented manufacture of mixed and

and coloured cotton-velvets, velveteens, velverets, thick-sets, cords, and other cotton piece goods, commonly called fustians. Dated April 5, 1803.

RICHARD FRANCIS HAWKINS, of Woolwich, Kent, Gentleman; for a method of applying a certain power to the working of ships and other windlasses, ship and other winches, cranes, and other purposes, to which the same hath never before been employed. Dated April 5, 1803.

JOHN LEACH, of Merton Abbey, Surrey, Calico-printer; for improvements on steam-engine boilers; which improvements are applicable to boilers in general. Dated April 7, 1803.

DANIEL PAULIN DAVIS, of Bloomsbury-square, Middlesex; for a method of cleansing and sweeping chimnies. Dated April 11, 1803.

JOHN TODD, of Bolton, Lancashire, Cotton-spinner; for a method of weaving and manufacturing woollen, cotton, linen, silk, and worsted cloths or stuffs; and also certain improvements on, and additions to, the machines used in weaving, by means of looms wrought by water, steam-engines, or any other power. Dated April 14, 1803.

WILLIAM HORROCKS, of Stockport, Cheshire, Cotton-manufacturer; for improvements on the loom for weaving of cotton, and other goods, by steam or water. Dated April 20, 1803.

SAMUEL DAY, of Charter House Hinton, Somersetshire, Esquire; for an engine or time-piece, which he denominates, "*The Watchman's Noctuary, and Labourer's Regulator.*" Dated April 20, 1803.

JAMES HALL, of Mellor, in the parish of Glossop, Derbyshire, Weaver; for improvements upon looms. Dated April 27, 1803.